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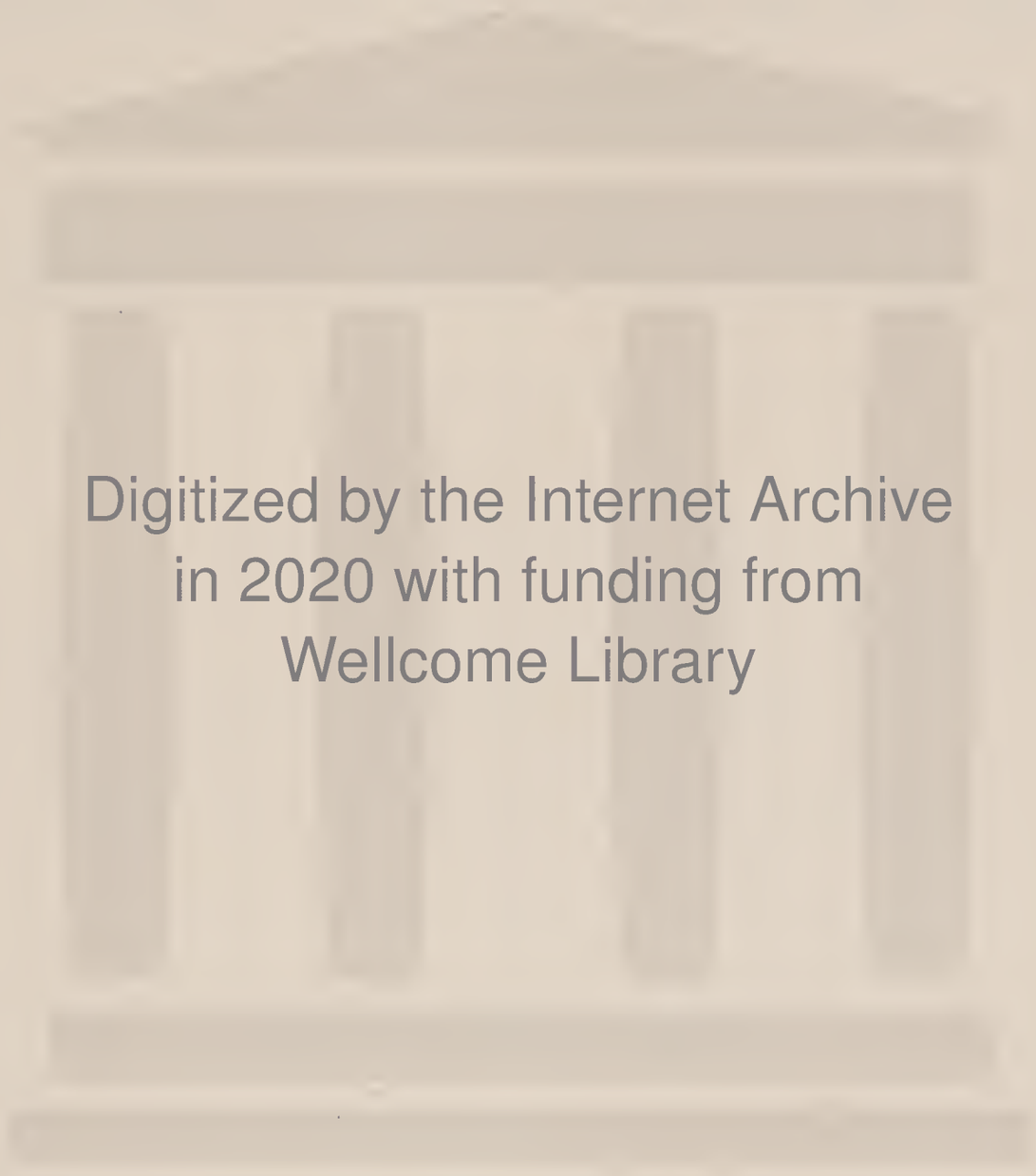

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THE MICROSCOPE

AND ITS RELATION TO

Medicine and Pharmacy.

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AN ILLUSTRATED BI-MONTHLY JOURNAL.

ANN ARBOR. MICH.

Vol. 4.

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VOLUME IV.

Index to Volume iv.

A.

American hog 184
American society proceedings ... 39
Animal or plant 56
Annual meeting for 1884 193
Aperture and working distance 246
Aspects of body in vertebrates and arthropods 225
Astasia hæmatodes 9, 73
Astasia vs. Englena 100

B.

Bacteria on coins 178
Bacilli of tubercle 68, 90, 91
Cholera Bacillus 284
Bacilcus, ode to 112
Bacillus of glanders 77
Bacillus staining 79
Bacillus tuberculosis, as an entozoon 18
Bacillus tuberculosis, detection of 115
Bacillus tuberculosis, how to stain 6
Bacteria, bicentenans of 91
Bacteria, easy method of staining 224
Bacteria in blood 236
Bacteria in dentine 121
Bacteria, of cattle distemper 177
Bacteria vs. fibrine 11
Beautiful slide 135 241
Beautiful snow 134
Beck's illuminator 157
Blood, corpuscles, identification of 219, 241
Blood, new element in 68
Bone, to mount 261

C.

Carmine staining 37
Casts, how to mount 78
Cullulose and crystals 262
Charbon bucillus in milk 44
Cicero and dentistry 92
Cilia in human kidney 92
Cleaning and mounting Polycystina 282
Clematis Virginia 96
Condenser, a new 105
Congress nose-piece 58
Cynips Quercus 146

D.

Decalcifying solutions 84
Deposits on snow 154
Desmids, how to mount 117
Diatoms, cutting sctions of 140
Diatoms, mounting in series 91
Dioscope, the 261
Disinfectants 134
Dissociating Fluids 85
Double injections 134

E.

Editorials 39, 40, 41, 65, 66, 67, 87, 88, 131, 132, 133, 160, 161, 180, 181, 209, 210, 228, 229, 230, 231, 279
Editor, life of an 105
Electric microscope 90
Embedding mixtures 125
Eyes, connected 91
Eye-pieces and condensers 107

F

Facility nose-piece 171
Fakir's secret 169
Freezing microtomes 137
Fungi in sewerage 196
Frogs, the, poem 65

G

Geological Discovery, an interesting 1
Germ of Swine-plague 67
Germs of Cholera 18

GERM ORIGIN OF DISEASE---------- 185
GERM THEORY AND DR. GREGG----- 188
GERM THEORY, present position of-- 114
GRIFFITH'S TURN-TABLE---------- 243

H

HAIR, medico-legally considered---- 197
HANDWRITING, examination of----- 207
HARDENING REAGENTS---------- 80
HINTS ON TECHNIQUE---------- 243
HISTOLOGY, study of---------- 90
HYDRASTIS CANADENSIS---------- 217

I

IMBEDDING IN EGG MASS---------- 42
INFLATION, a microscopic---------- 10
INFUSORIA, how to keep living------ 64
INFUSORIA, how to kill---------- 45
INFUSORIA, potassic iodide for preserving---------- 23
INJECTING ---------- 49
INSECTS, e amining heads of-------- 135
INSECTS, how to mount---------- 211
INTERCELLULAR SPACES---------- 259

L,

LOWEST FORMS OF LIFE---------- 254

M

MAILING CASE---------- 179
MCCALLA NOSE-PIECE---------- 101
MEASUREMENT OF BLOOD-CORPUSCLES ---------- 60
MICROBES, action of cold on--------- 178
MICROCOCCI OF PNEUMONIA---------- 177
MICROMETER, eye-piece---------- 37
MICRO-ORGANISMS IN SOIL---------- 178
MICROSCOPICAL INCIDENT---------- 33
MICROSCOPY AT PHILADELPHIA----- 237
MICROSCOPY 150 YEARS AGO---------- 74
MILK OF ANIMALS WITH CHARBON, 178
MOSS, how to mount---------- 44
MOISTURE, to prevent beads of------ 117
MORPHOLOGY OF RHEUMATIC BLOOD 195
MOUNTING ---------- 36, 173
MOUNTING, DIATOMACÆ ---------- 281
MOUNTING FLUID, a new---------- 38
MOUNTING INSECT ORGANS---------- 44
MOUNTING POLLEN---------- 44
MOUNTING POLYCYSTINA ---------- 282
MOUNTING, rapid---------- 20
MULTIPLE IMAGE, the phenomenon of---------- 273

N

NEW MICROSCOPICAL JOURNAL----- 40
NORMAL FLUIDS---------- 85

O

OBJECTS, reconstruction of---------- 45
ORGANISMS IN WATER---------- 91

P

PARABOLA, as an illuminator------- 27
PARAMÆCIUM AURELIA---------- 127
PARASITE IN "CHICKEN GAPES"--- 272
PEPPER, adulterated---------- 90
PINEAL GLAND---------- 261
POLLEN, how to mount---------- 44
PRACTICAL BENEFITS FROM THE MICROSCOPE---------- 36
PRAYER, the Doctor's---------- 232
PRESIDENT COX'S ADDRESS---------- 201

R

REFLECTION OF LIGHT IN LEAVES-- 262
REMARKS OF DR. DALLINGER------- 195
RESULTS OF MICROSCOPICAL RESEARCH ---------- 275

REVIEWS.

A COUNTRY DOCTOR---------- 185
AMERICAN MEDICAL PLANTS---- 288
BOTANICAL MICRO. CHEMISTRY-- 46
BRAIN. methods of studying----- 93
DESMIDS OF THE UNITED STATES 166
DRUGS OF NORTH AMERICA------ 142
FARM CONVENIENCES---------- 118
HEART OF THE CONTINENT------- 142
HISTOLOGY ---------- 288
HOMŒOPATHIC PHARMACOPŒIA 118
HOUSEHOLD CONVENIENCES----- 118
ILLUSIONS ---------- 167
KINGDOMS OF NATURE---------- 70
MEDICAL DIAGNOSIS---------- 166
MICROMETRY ---------- 47
MONEY AND EXCHANGE---------- 47
ORIGIN OF SPECIES---------- 189
PALACE PRISON---------- 188
SCHOOL HYGIENE---------- 93
SEXUAL NEURASTHENIA--------- 141
SHAKESPEARE AS A PHYSICIAN-- 141
STARCH, treatise on---------- 94
THE DRUGGISTS DIARY---------- 47
THE HUMAN BODY---------- 46
VEGETABLE BIOLOGY, lessons in 118
WHITE MOUNTAINS, the---------- 188
WORLD-LIFE ---------- 70
WORLD'S OPPORTUNITIES-------- 215

RENAL CALCULI, the origin of------- 274
REVOLVING MICROSCOPE---------- 35
REVOLVING TABLE, substitute for--- 44
RHIZOPOD, a queer---------- 219
WONDERS OF PLANT LIFE---------- 70

S

SCARLET FEVER, micrococcus of ---- 22
SCIENTIFIC FALLACIES---------- -- 235
SECTION CUTTER, new---------- 205
SECTION CUTTING---------- 123
SECTION-FLATTENER---------- ---- 25, 187
SOIREE, annual---------- 63
SOLID WATCH-GLASS.---------- 176
SPONGE.---------- 182
STAINING ---------- 149 171
STAINING SECTIONS ON THE SLIDE-- 22
ST. LOUIS MIC. SOCIETY ---------- 129
STUDIES IN HISTOLOGY, Lesson I---- 49
" " " " " II--- 80
" " " " " III.- 123
" " " " " IV.- 149
" " " " " V.-- 171
" " " " " VI-- 265

T

TEETH AND BONE, mounting---------- 139
TEETH, the decay of---------- 90
TINTINNIDIUM SEMICILIATTNI------ 102
TOLLES, ROBERT, a biographical sketch of---------- 34
TOLLES, memoir of---------- 202
TOOTH, how to make section with pulp ---------- 8
TRICHINOSIS---------- 92
TRICHINOSIS, epidemic of---------- 22
TUBERCLE BACILLI---------- 135, 137 262
TEBERCLE BACILLUS, rapid,method of showing---------- 13

U

UNUSUAL INFUSORIAN---------- 248
URINARY SEDIMENTS---------- 137

V

VEGETABLE SECTION, how to stain and mount---------- 212

W

WAVES OF LIGHT, poem---------- 145
WENHAM BUTTON ---------- 134
WHITE ZINC CEMENT-------- 62
WORKING DEPARTMENT---------- 243

Y

YELLOW FEVER MICROBE.---------- 45

Z

ZENTMAYER NOSE-PIECE---------- 224

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CONTENTS.

PAGE.

Original Communications.

An Interesting Geological Discovery. By C. L. Peticolas..... 1
Biographical Sketch of Robert Tolles. By Hon. Thomas Barlow..... 3
Robert B. Tolles. By C. H. Stowell. 4
How to Stain the Bacillus Tuberculosis. By T. J. Burrill..... 6
How to Make a Section of Tooth with Pulp. By F. O. Jacobs..... 8
Astasia Haematodes. By S. Lockwood..... 9
A Microscopic Inflation. By C. H. Stowell..... 10
Bacteria vs. Fibrine. By D. S. Kellicott..... 11

Editorial Excerpts.

Dr. Gregg vs. The Germ Theory ... 18
Germs of Cholera..... 18
The Bacillus Tuberculosis as an Entozoon..... 18

Selections.

Rapid Microscopic Mounting..... 20

Items..... 22
At the Doctors' Expense..... 23
Our Next Issue..... 23
Exchanges..... 24

Original Communications.

AN INTERESTING GEOLOGICAL DISCOVERY.

BY C. L. PETICOLAS.

It has not heretofore been supposed that the great diatomaceous formations of Maryland and Virginia extended beyond Chesapeake bay, although this stratum has been struck at a great depth at Fortress Monroe several years since.

An artesian boring recently made to the depth of about 300 feet in Dorchester County Maryland, has brought to light what is evidently a continuation of the Maryland deposit, corresponding very closely to the formation shown at Holland's Cliff and Piscataway. The drill used was unfortunately not adapted to bring up a solid core and it makes a diatomist's "blood run cold" to fancy the havoc played with

his little favorites by the grinding and pulverising effect of the ruthless steel. An examination of the mingled mud and sand pumped to the surface shows plainly enough this destructive action, but strange to say, a large percentage of the diatoms are unbroken and enough remain to show this one of the most beautiful and characteristic parts of the great Atlantic coast deposit.

Many varieties of Coscinodiscus appear, among which may be particularly mentioned the beautiful C excavatus of Greville. The genus Craspedodiscus is represented by a greater variety in size and form, than I have seen elsewhere. T. Marylandica is abundant and presents most remarkable variations of form, from a well-defined triangle to a nearly perfect disc—with and without central umbilicus. It was perhaps one of these last that was classified as Symbolphora Trinitatis by Ehrenberg—a puzzle and aggravation to every diatomist who has since looked in vain for this wonderful species. There are several other lively forms new to me, and not shown by Schmidt or Van Heurck. Some day perhaps, our kind editor will get up illustrations of these, as a mere verbal description would reveal but little of their beauty. A serious reflection for us Atlantic coast dwellers occurs in connection with this discovery—if a deposit which comes to the surface at Richmond, Petersburg and many other points about the same distance from the coast in Virginia and Maryland, is found buried 300 feet deep just over Chesapeake bay; it is evident that matters are not progressing with that steady uniformity so desirable to inhabitants of the surface of our planet and that, being, so to speak, perched upon one end of a continental see-saw, our posterity may in the course of 15,000 or 20,000 years find their local habitations raised to an uncomfortable height or, perhaps, buried deep under the waves of old ocean once more.

Below is a list of the forms identified, many of which although clearly of the same species as are found in other parts of our diatom formation, are still distinguished by such peculiarities of outline or areolation as marks them distinctly for this locality:

1. Coscinodiscus Oculis Iridis.
2. " excentricus.
3. " craspedodiscus.
4. " excavatus.
5. " apiculatus.
6. " radiatus.

7. Sceptrionis gemmata and caduceus.
8. Eupodiscus Argus, 3, 4 and 5 processes.
9. Systephania corona and diadema.
10. Podosira Neumayerii.
11. Orthosira Marina.
12. Actinoptychus senarius.
13. Heliopelta Metii.
14. Mastogonia—various.
15. Biddulphia Tuomeii.
16. Dyctiocha—great variety.
17. Triceratium undulatum.
18. " obtusum.
19. " condecorum—Brightwell.
20. " Marylandica.
21. " Americanum—Ralfs.
22. " Punctatus.
23. " Solanoceros. Ehr.
24. " Fischeri. Schmidt.
25. Raphoneis pretiosa and rhombus.
26. Navicula Lyra.
27. " du Vorigens. Schmidt.
28. Asterolampra Marylandica.
29. Pyxidicula cruciata and appendiculata.
30. P Angulatum—large form.
31. P Virginica similar to Richmond.
32. Hemiaulus Bifrons—Grunow.
33. Cyclotella, several species.

BRIEF BIOGRAPHICAL SKETCH OF ROBERT TOLLES.

BY HON. THOS. BARLOW, OF CANASTOTA, N. Y.

Mr. Tolles put himself under the instructions of the far famed Charles A. Spencer as an apprentice in the art of manufacturing optical instruments in about 1845 or 6, in his boyhood. He was a young man of steady, industrious habits, and applied himself closely to his pursuit.

He held Mr. Spencer in the highest estimation and made him his study as well as master. His genius was promising, and Spencer saw in him a hopeful future.

He was not an original thinker, but built upon the knowledge and artistic skill of Spencer. He was far from being the reader and scholar that Spencer was, the latter being well informed in all the natural sciences and philosophy of things, whilst Mr. Tolles was far in the background in these respects.

It was in the artistic faculties that Mr. Tolles sought and attained to success. He had all of the advantage of the triumph of Spencer and endeavored to improve, if possible, upon his work, not by a departure from his plans and principles, but by a finer, or more perfect work in the same field and line of pursuit. His first victory was an improvement in the field of the Coddington pocket-glass, for which he received much praise, and from Spencer, too. This was while he was with Spencer, in Canastota, N. Y. He was with Spencer or in Canastota fifteen or sixteen years, and attained to an ability of making object-glasses for microscopes of very fine and effective powers before he left Canastota, and his name began to go out far and near to his praise and honor. He left for Boston about 1862, and there he rapidly rose in his skill and art, until he equaled the best manufacturers in our country.

Being very retired in his habits he mingled with, and courted society but little, and was reserved and exemplary. At an early day, he married Miss Dickey, an interesting young lady, who died about two years after her marriage.

He had but limited means to aid him, and had to depend upon his own efforts for success in life.

ROBERT B. TOLLES.

BY C. H. STOWELL.

WE have been able to collect the following facts concerning the life of this eminent man. We are largely indebted to the Boston papers, kindly sent us by Mr. Chas. Stodder, for the following account:

Mr. Robert B. Tolles, of the Boston Optical Works, who died at the Massachusetts General Hospital on the 17th inst., had a world-wide reputation as a maker of microscopes and particularly as a maker of microscope objectives, such as are required by and used in the highest class of scientific work.

Mr. Tolles was born in Connecticut sixty-two years ago, but at an early age went to New York, where, while yet a young man, he entered the employ of the firm since widely known as Spencer & Son, optical-instrument makers at Canastota, with whom he learned the business of grinding lenses and the mechanical construction of microscopes and telescopes. After being with that firm a number of years, he set up for himself in the same line of business in the same town. He remained there until 1866, when he came to Boston,and,in connection with Mr. Chas. Stodder founded the Boston Optical Works, which business connection continued until his death; and it was here that the most of his reputation as a maker of first-class objectives for the microscope was achieved. He was among the first to produce what are known as wide angle objectives, and to demonstrate their superiority in showing the finer details of the structure of objects. Although not the discoverer of the immersion objectives, he at once recognized their great value, and was among the first to manufacture them.

Mr. Tolles was the inventor of many valuable accessories both of the microscope and telescope, but undoubtedly his greatest achievement in this direction was his demonstration of the practicability of the homogeneous immersion objective and its superiority over other lenses. This he demonstrated in 1871, but owing to the fact that at that time Canada balsam was the only fluid known to possess the same refractive index as crown glass, his discovery remained useless until 1877, when Professor Abbe discovered a fluid which was practical for such a purpose. Since then a large number of such objectives have been made and numerous discoveries made by their use which would have been impossible with the old water immersion lenses.

Mr. Tolles was a very quiet, unassuming gentleman, who devoted his whole life to his work. He had not been in health for a long period of time, having been a sufferer from a chronic lung disease to which most men would have succumbed years ago. In his death the scientific world has sustained a great loss.

Dr. Geo. E. Blackham writes from Dunkirk, N. Y.:—

The loss to microscopy throughout the whole civilized world is simply irreparable; but to us who had the happiness to be counted among his personal friends there is something more than the mere

eclipse of a great light in optical science. Mr. Tolles's lofty character, his frankness, his honesty, his modesty and dislike for anything that savored in the least of boastfulness, his peculiar reserve and the warmth of his friendship when once the ice was broken, endeared him to his friends as much as his marvellous genius and unsurpassed skill in devising and constructing new optical combinations distinguished him in the world of applied optics. To the scientific world at large he will live as the man who dared attempt what the accepted authorities had declared to be impossible; as the man who not only dared to attempt, but succeeded in turning the "180° corner;" as the rare combination of artisan, artist and scientist whose work was not made "to sell" only, but who, ever striving to surpass himself, wrought each new objective as if it were his only one, putting into each a portion of his own individuality and making a work of art rather than an article of commerce; but to those who knew him more intimately he will live as the shy, reserved but warm-hearted man of genius. Standing, as he unquestionably did, at the very pinnacle of his profession, his death leaves a vacancy not readily filled.

TO STAIN BACILLUS TUBERCULOSIS.

BY T. J. BURRILL.

THIS subject is well-nigh threadbare, but the following may be acceptable to many who, like myself, are interested in easy methods as well as in good results.

So far as I know everyone has heretofore advised an alcoholic solution of the aniline dye or dies, more or less diluted with water. In my practice the following disadvantages and difficulties were met with: first, frequent failure of the stain, especially when too little water was used; secondly, rapid evaporation, leaving when left too long, a gummy mass on the dish and cover-glass hard to remove, and worse still a deposit of granules or little drops of aniline oil on the cover which no washing would remove; and thirdly, the liability to get one's hands, the table, etc., tinted, as well as the organisms by the "running" or "creeping" tendencies of the stain.

To avoid these and some minor perplexities many ways have been tried to leave the alcohol out and yet obtain a stain as good as

that of the published formulas. The following seems to be the thing sought:

Glycerine	20 parts.
Fuchsin	3 "
Aniline oil	2 "
Carbolic acid	2 "

A little variation in the quantities is not important; but the glycerine must not be much less, more may be used. The fuchsin is the common aniline-red of the shops, called also magenta. Mix all together and shake or stir well. This mixture may be kept in stock and no deterioration occurs as is usual with the alcoholic ones after a few weeks.

When ready to use the stain put two or three drops into a watch glass (or other dish) full of water and stir. Occasionally precipitation suddenly occurs if the stirring is at first too violent, but when once dissolved nothing of this kind happens, for it is the water which evaporates if anything, not the glycerine, which, like alcohol, is the stronger solvent of the coloring material and the oil. The color now should be a very light cherry-red, much too diffuse for writing ink and so that touched to the hand and wiped off scarcely a trace remains. In this the sputum on cover-glass may be placed to remain from ten minutes to several days at the ordinary temperature of an occupied room, but the best results are obtained by heating from 80° to 100° Fahr., and for a fourth to a half hour. But if quicker, though for permanent mounts less satisfactory, results are desired, boil a little water in a test-tube and at once add about double the quantity before suggested of the stain by letting it run down the tube held a little obliquely and gently shake. Now pour the hot liquid into an open-mouthed dish and immerse the coated cover-glass one to two minutes without further attention to the temperature; decolorize and examine.

By these methods with this material there have been no failures in many trials, no vexatious precipitations mar the results, and everything is easily cleaned up, whether done immediately or at one's convenience afterward.

Spread the sputum thinly on a cover-glass, heat in a flame until nearly scorched, stain, put into nitric (or hydrochloric) acid and water, one part to four or more, until decolorized, say one minute, wash in water and examine; or if desired stain the ground material

with aniline blue ("package" blue answers) in glycerine not too deep in color, one minute, and wash with water. When well dried mount directly in balsam. When well stained a good $\frac{1}{4}$th or $\frac{1}{5}$th in. objective shows the bacilli well.

HOW TO MAKE A SECTION OF TOOTH WITH PULP.

F. O. JACOBS.

A HARD section of a tooth with pulp can be prepared by the following method:

As soon as the tooth is extracted it should be immersed in alcohol and kept there until you are ready to begin work. To do the work you should be prepared with a polishing lathe, and emory wheels, such as dentists use. The wheels should be about five inches in diameter and three-fourths of an inch thick, also a small felt wheel for pad to hold the section while cutting.

One emery wheel should be very coarse to do the first cutting rapidly, then a medium, and for the finishing wheel made of the finest flour of emery.

Begin work by holding the tooth to the circumference of the wheel with the thumb and finger of each hand. Cut down the tooth on each side until you see the pulp, sliding the tooth back and forth across the wheel so as to grind evenly from the crown to apex of the root. Keep the wheel wet all the time with plenty of distilled water. The tooth should now be returned to the alcohol and kept there a short time, say for half an hour. When you begin cutting again use the flat surface of the same wheel cutting one side, then the other until your section is about one-eighth of an inch thick. Now use the next finer wheel, and go from that to the finest for the final polishing, returning the section to alcohol occasionally for a few minutes so as to keep the pulp as hard as possible. Use the felt wheel as a bed for the section while grinding. Keep a good tooth on your emery wheels by washing in alcohol and rinsing in pure water before the alcohol dries.

Cut the tooth one side then the other alternately so as to insure your taking the section from the center of the tooth; otherwise the pulp will tear out, and the canaliculi shows better from this portion of the tooth.

When the section is as thin as desired, it should be carefull

washed in distilled water and examined under a one inch objective to see that the fibers from the felt wheel are all washed from the pulp. The pulp can now be stained with carmine, and the section kept in alcohol, until you are ready for mounting, when the section should be passed through clove oil to thin balsam. Leave it in a small dish an hour before placing it upon the slide. Do not leave it in the clove oil too long as that would obliterate the canaliculi.

[Read before the New Jersey State Microscopical Society, November 19, 1883.]

ASTASIA HÆMATODES.

BY PROFESSOR SAMUEL LOCKWOOD.

THE announcement of the discovery in the fauna of the New World of a well-known Old World form, even in the infusoria, should be made only upon due consideration. Hence, to find for the first time an undoubted species common to both continents, is both a pleasure and a surprise. Last September while pond-hunting near Twin Mountain House, White Mountains, N. H., I observed what appeared to be a red gore, or scum on the surface of a still and shallow pool, in a mountain meadow. It looked like a red oxide. Several visits led me to believe that it gathered on the surface, then sank to the bottom. I have seen pollen of a deep orange, but never of a blood-red; yet I looked sharp for any flowers that might drop their pollen on the water. There were none. Some of this red matter was secured in a vial and soon after examined in the microscope. To my astonishment it was the singular infusorian *Astasia hæmatodes*. Though not the pretty object that some of the rotifers are, this infusoria is extremely interesting, on two considerations especially.

First, its distinctly amœboid habits. Its vicissitude of form is quite remarkable for a distinctiveness of method. You see it elongate into a spindle. After resting it changes into a pear-shape. After another repose it becomes globular, in fact an oblate spheroid. Still another rest, and it is flattened into a perfectly circular disc.

As respects organs, it seems organless, and is almost as simple in its structure as an amœba. True, it has a point-like projection, like the merest apology for a tail, which, in an adhesive way, it can convert into a point-d'appui, thus securing a sort of swinging move-

ment in common with some of the more highly organized infusorians. It has also a gliding movement, very like that of an amœba, but never evolving pseudopodia as that does.

Second, this our Astasia is subject to, or capable of: striking color changes. In truth it deserves to be called the chameleon infusoria. The colorless pellucid protoplasm, which mainly constitutes this living microscopic spec, has in it many vacuoles, and these seem to be in two series, the one series containing chlorophyll grains, and the other series granules of red pigment. When the little creature is active, and is changing its form, as described above, it will assume these colors in alternations, sometimes both green and red at the same time, making it a charming little object. It is a wonderful sight to behold these changes of form and color—now a reddish spindle, anon a blushing red pear; next the globular form and the disc are assumed, and now a beautiful green predominates; and even here comes about a pretty color change from a grass-green emerald to a blue-green turquois. I had hoped to make further study of my prize, but a few days of illness separated me from them, during which every specimen died.

A MICROSCOPIC INFLATION.

BY C. H. STOWELL.

DR. OLIVER WENDELL HOLMES took occasion not long since to tell the medical students of Harvard College how large they would appear if placed under one of the Harvard microscopes. We must confess we have seen Harvard students who acted as if they were looking at themselves under one of these magnifying glasses. Dr Holmes says they would be as high as Mt. Etna, and correspondingly broad.

Now if one of our Michigan University students could be magnified to the same degree that we magnified some blood corpuscles last evening he would reach from the level of the sea to the top of the highest mountain in Asia. In fact that would be a good chair for him, as his head would be thirty thousand feet above this peak.

In proportion to his height Mt. Blanc would be as a foot-stool to us.

He could rest his shoulder on the base of Pike's Peak in

Colorado, and throw his arm over the apex and down the other side until his finger tips would touch the base again.

If one of the ears of a Harvard student should chance to fall under this glass it would appear as high as the old Greylock Mountain of his own state. These facts may not be purely scientific, nevertheless Harvard College must not try to excel us in *magnifying* things.

BACTERIA vs. FIBRINE.

REPORT OF COMMITTEE ON PAPER.

BY DR. R. R. GREGG, READ AT THE SEPTEMBER MEETING OF THE CLUB.

Gentlemen of the Buffalo Microscopic Club.

YOUR committee appointed at the September meeting of the club to examine into and report upon the claims of Dr. Rollin R. Gregg, advanced in a paper entitled "The Bacteria or Germ Theory of Disease Overturned," read before us at the same meeting, has examined the same as directed to do and hereby present a report accordingly.

It is unusual for this club to require such duties of its members as those laid upon us. Dr. Gregg is not a member of this club; he is engaged in the active practice of a profession, and he is a fellow-townsman; he has boldly assailed and controverted the position of some of the foremost investigators in the world, concerning a question of the highest import to all mankind, one concerning which all should have correct and definite notions; he has based his opposition mainly upon his own observations; he states his conclusions with a positiveness unusual for an investigator in a field surrounded by so many difficulties as all acknowledge pertains to the bacteria. In this paper some problems, heretofore considered exceedingly crabbed, are settled with such ease that one feels quite uncertain of his ground; besides, the paper having been, in part printed in the newspapers, has already called out more or less extended remarks from various writers. In view of these facts permit us to say that we feel how delicate a matter we have in hand, and at the same time, how grave a duty. In the discharge of this duty we have impartially examined the evidence in the case and have candidly and fairly stated below what we have found and agreed upon.

Dr. Gregg has been very kind and courteous in showing the committee his objects and apparatus, in explaining to us his methods and the salient points of his paper, for which we take this opportunity for expressing our appreciation and thanks.

Perhaps it is a work of supererogation to remark in the presence of this club that one untrained in the use of the microscope cannot form a definite opinion or just conclusion concerning this or any other matter of investigation with the microscope, until made acquainted with the character of the instrument employed and the methods of research pursued. Especially is this true in the study of the minute objects regarded as bacteria, whatever may be their nature. We will, then, first refer to the Doctor's apparatus and his methods of examining objects.

The observations detailed in the paper were made with a Bausch and Lomb "Model" stand, "professional" one fourth inch objective of 110° angular aperture, and one and one-third inch Huyghenian eye-piece; the combination gives about three hundred diameters. The objective appears to be a fairly good one of its grade. The illumination employed was light from a centrally placed mirror; direct and diffuse sunlight without the use of a diaphragm is a favorite method of illumination with Dr. Gregg. He studies his objects *dry, without cover-glass!* Any worker with the microscope will understand how much allowance must be made for errors that are sure to occur in this method of examination. In preparing a slide of "bacteria" for study he proceeds thus: The material—blood or fibrine, whether fresh, boiled or rotting—is taken from its receptacle with a stick and gently drawn across a glass-slip, after which it is allowed to dry, either at the ordinary temperature of the room or it is more quickly dried by means of heat. The preparation is then examined after the manner mentioned above, when the various forms or appearances of the "bacterists" arise. Is it remarkable that he sees all, and more of the bacteria of the catalogue? We think not. Nor is there any wonder that he exclaims on thus examining blood boiled for an hour, "all the forms that the 'bacterists' ever pictured or saw, in their bacteria, are exactly represented in boiled blood; and there are many more forms found than they have ever mentioned."

"There are the so-called micrococci by the million; there are spherical bacteria 'aggregated in pairs and in fours,' or in any other

number that may be wished; there are 'chaplets' and 'rosaries' in great numbers, and straight strings of beads by the hundred; there are 'dumb-bells,' 'clubs,' and 'rods;' there are 'straight rods,' sometimes (often) of considerable length, which break up by transverse sub-division into separate cells; there are 'threads,' and threads fetted into swarms;' there are 'spirals', single and double, triple and even quadruple; there are chains with short and close, and with open and long links; there are stocks with lashes on them much like whips, and also 'shepherd's crooks;' there are 'tails' and 'spikes,' and still other forms; and all consisting of healthy blood which had been organized by standing first into, etc."

Dr. Gregg does not employ staining agents, such as the aniline dyes, which are so readily absorbed by the protoplasm of what are called bacteria (organisms by the way, which Dr. Gregg admits do exist), and which action in connection with proper treatment subsequently distinguishes these forms from fibrine threads, as the color absorbed by the latter is discharged by washing in water, alcohol or nitric acid, but not so from bacteria. Nor does he attempt to cultivate, after either of the approved methods of Pasteur or Koch, the objects he says are fibrine threads and granules simulating bacteria so closely as to have deceived the very elect.

So it will be seen that the doctor disregards all methods of identifying these minute objects but one, viz.: Appearances in a dry film of albuminous matter, seen under circumstances about as trustworthy as taking the typography of a country from a balloon through a fog. By such means he seeks to prove that fibrine forms are identical with the bacteria of disease or putrefaction and tries to overturn the work of masters!

Turning now from his methods of work with the microscope let us make a brief analysis of the paper.

Dr. Gregg states that, "I have controverted the theory of the bacterists for years, and contended that all their so-called bacteria of disease were nothing more or less than so many different forms of fibrine. Now for the proof of the correctness of my position. * * * * * * * It occurred to me to boil and also to rot some blood and see what the effects of both would be upon the fibrine it contained. * * * * * * * My idea was to first partially and then wholly destroy that cohesive power that exists between the molecules of fibrine and watch the results. Behold what a revela-

tion! Nothing more marvelous was ever seen in the microscopic world; and a new science has thereby been opened to the study of men."

The foregoing brief consideration of the methods of experimentation, it seems to us, is sufficient to do away with all claims that can be urged in favor of these methods of so easily proving statements so important. Nothing in favor of his position can be proven by them, but briefly his reasoning from his data. He regards all the forms seen on the slides as varying forms of fibrine. What has become of the remains of the red and the white corpuscles, which the best analyses have shown represent 45 per cent. of the blood, where are the other substances that with the fibrine go to form the plasma of the blood, where is the albumen, the fatty matters, the crystallizable nitrogenous matters, and the mineral salts, any one of which is present in greater quantity than is the fibrine.

How can Dr. Gregg detect the form taken by the fibrine when in so minute a proportion and in so large masses as he examines. But Dr. Gregg specifically states after enumerating countless forms similar to all the bacteria described by observers, that "all consisted of fibrine of healthy blood which had been organized by standing, first into granular, then into threads or fibrils, more or less of spiral form; and next partially disorganized by boiling to take all the numerous forms to correspond exactly with what the "bacterists" have seen in disease and miscalled bacteria. Again we ask can we logically place any credence upon such statements. Looking for the fibrine under such circumstances is like looking for the needle in the hay-stack; or more exactly like trying to select in an army of a thousand men, three friends in uniform similar to the rest, the work to be done with a poor telescope and at a distance.

But we will proceed further: "Rotted blood shows even still more astounding results. It gives far greater numbers of all the forms just named and many more besides. There is nothing in the way of a thread or a combination of threads, or of granules, can be put into that is not imitated more or less exactly by fibrine in rotting blood."

Again "we have nearly the same proportion of fibrine in rotting blood as in boiled blood." But the doctor has overlooked the fact that to-day the most eminent scientific men

and trustworthy observers in this field agree that the process of rotting, or putrefaction, is due to the influence of the bacteria. "It is an accepted fact that no putrefaction can occur without the presence of bacteria and they are the sole cause of such decomposition." In proof of this we cite the voluminous experimental works of Schrœder, Dusch, Pasteur, Schwann, Helmholtz, Tyndall, Cheyne, Ziegler, Magnin, Sternberg, Van der Broek, Roberts and others.

Had Dr. Gregg taken proper care to exclude the germs of bacteria from the blood it would not have rotted in the time of his experiments or if he had taken proper care to detect the bacteria he would have found them in countless hosts doing their proper work in his rotting blood.

These experiments are therefore worthless, proving nothing against the theory he set out to overturn and the strain of philosophical musing in which the author indulges rests upon the pure fabric of imagination and belief.

To avoid error, however, the doctor further treated a clot of blood so as to obtain as nearly pure fibrine as was possible in a crude way. This fibrine he boiled and rotted and treated in various ways; he states, "with much the same results in many particulars, although it was not so rich in developments as the rotting blood." We have examined many of these specimens carefully and in several ways. In one the usual forms of fibrine are plainly shown and easily recognized. The specimens prepared from rotting fibrine were make up of bacteria as is plainly revealed by careful staining. We may say here that we have separately and collectively made experiments to test the identity of fibrinous forms with bacteria and the results were in every case negative. In no single instance was fibrine found to imitate the bacteria in its behavior towards the various reagents that are used in the study of the bacterial forms. We find further that early in the study of these organisms one of the most prominent "bacterists" called attention to the necessity for the use of some ordinary care in the study of bacteria in order to avoid the very mistakes that Dr. Gregg unjustly assumes have been made. Years before Dr. Gregg called attention to this subject, Cohn mentions the resemblance between filamentous bacteria and that of fibrine as it separates from the blood. European observers have been working with their eyes open and

forewarned so as to avoid such errors. In their investigations such care and skill was used as to put out of the question all such arguments and claims of inaccuracy as those under consideration.

A further consideration of the paper brings us upon more of the doctor's reasons for such experiments; he says: "and here let me tell the scientists that if they wish to study the buildings up of life in all its shapes and in all its forms, whether animal or vegetable, they must study its buildings down. That is, if they will study the disintegration of organic matter under decay, they will find it going down step after step, in regular order from the higher or highest organization, down to the next below and from this to the next lower still, and so on until it disintegrates into its water, gases and salts or other inorganic matters; and in this going down it accurately repeats every step, but in the exact inverse order of its going up."

The doctor states this as positively as though it were a law of nature and says "it is not improbable that it is a law." We cannot agree in this, but think that it is not a truth. It seems improbable *that the disintegration due to bacteria has any special bearing upon the development.* It would be as logical to call the disintegration of a house by fire a repetition of its building up, only in an inverse order.

To make still more perspicuous why we do not concur with the statements of the paper, allow us to cite one or more special cases. The doctor repeatedly speaks of the organization and life of the fibrine. These are his words: "Indeed, fibrine possesses a most remarkable life, or tenacity of life, of its own. In one specimen of the blood boiled for an hour there is as beautiful an example of organization as could be anywhere found in animal life, and which was apparently the result of the organizing forces possessed by the fibrine, independently of, or separated, as it was, from all other life or sources of life. This specimen quite evidently organized on the glass-slide, after the drop of boiling hot blood was placed there and while it was cooling and the fluid part evaporating from it." [!!!]

In our opinion the formation of crystals from a saline solution on evaporation would be as conclusive evidence of the vitality and life of the salt. To prove the above overwhelming propositions this investigator puts a drop of fresh blood, or one of boiled blood, or a drop of an exudation from a blister on a glass slip and allows it to dry; on examination a net-work of dark lines appears; lo, here is an

organization of fibrine! And upon this he theorizes regarding spontaneous generation and hints that the veil of mystery concealing life and vitality is about to be pierced. The reasoning and example are only equaled, it seems to us, by some of those wonderful transmutations put forth in Dr. Bastian's "Beginnings of Life," for example, the conversion of milk globules into fungus germs, after Turpin (1837). The doctor's attention was called to the fact that when a drop of water was added to the dry blood the "organization" disappeared, and when the color had been discharged the real fibrine of the drop then appeared as an intricate plexus of very fine threads spread over the slide. The doctor responds "that fibrine organizes differently under such circumstances." He further says "that when examined in direct sunlight he can see the *granules* which compose the threads." No doubt the net-work in question is quite familiar to most of you, and no doubt most of you would naturally attribute it to drying. Another instance: A drop of blood *covered* at 2 P. M. in the evening was found to exhibit "fibrine organization" under different circumstances from the above—the mesh was finer ("absence of air the cause"). This case was presented to the committee as an example, or simulation, of *dry-cultivation of bacteria* after Koch's method. It is marvelous.

It seems unnecessary to follow this subject further. It must be apparent to any one having one grain of manipulative skill and only slight acquaintance with correct methods of microscopical investigation, that no reliance can be placed on such observations, and that all conclusions based on such may be dismissed without serious examination. What astonishes us is that such evidence should be put forth to controvert the teachings of the keenest investigators of the age, or any age. This paper will not check one breath of time the advancing army of those who believe the germ theory of disease to be true. But it does add Dr. Gregg to company whose attitude to this doctrine is so aptly expressed by one of the vice-presidents of the British Association for the Advancement of Science this year, referring, however, to the opponents of another science; he says of those of his non-party that they have at length gained the victory; nevertheless, they have each, doubtless, from time to time

> "'Heard the distant and random gun
> That the foe was sullenly firing.'

"The 'foe,' to speak metaphorically," he continues, "seems to consist of very irregular forces, occasionally unfair but never dangerous, sometimes very amusing and frequently but badly armed, or without any real armor. The Spartan law which fined a citizen heavily for going into battle unarmed was probably a very wise one."

Committee { D. S. Kellicott, Ph. D., F. R. M. S.
Lee H. Smith, M. D.
Jacob Frank, M. D.

EDITORIAL EXCERPTS.

BY C. H. STOWELL.

DR. GREGG VS. THE GERM THEORY.

Dr. Boynton, in the New England Journal of Dentistry, has some very sharp things to say on the above subject. After he has read the report of the committee given in this number he will have plenty of proof that he was in the right. It is only to be regretted that any person was obliged to waste their time in replying to such a scientific fraud and humbug. It has been a long time since such a stir has been made about "great discoveries" which resulted in so complete a disaster to the inventor. Dr. Gregg says he has "done the job," and in the opinion of every true scientist he has succeeded so far as he is personally concerned. He is buried so deep beneath the rubbish of his own "charcoal organisms" that Dr. Boynton and all the rest of us together will never be able to find where he was "mortally wounded."

As the editor of the *Scientific and Literary Gossip* says: "when will the time come when the medical profession will have a scientific education?"

GERMS OF CHOLERA.

Dr. Wm. B. Carpenter, of London, says that Professor Tyndall is wrong in stating that *all* cholera germs are bred in the human intestines, and from them by means of excrement are diffused. Dr. Carpenter gives three cases where cholera was caused by offensive piggeries, by a retarded drain in marshy ground, and by a compost heap of unnamable filth in an unused yard. The outbreak of fatal disease in each of these cases was directly traced to these sources, the effluvium being borne on the wind. In each the disease was successfully combated and finally conquered by the removal of the filthy cause.

THE BACILLUS TUBERCULOSIS AS AN ENTOZOON.

In the British Medical Journal is an article on the above subject. It describes a disease of the lamb that causes very serious losses to sheep-farmers, as due to the presence in the bronchi of numerous individuals of a species of nematode worm, the *Strongylus filaria.* The habitat of this parasite makes it possible to bring parasiticides into contact with it. This means of arresting the disease in fact has

been resorted to with complete success. Mr. Knight, of Kozouzah, a large sheep-owner, treats his diseased flocks as follows: He drives a hundred or more lambs into an air-tight room into which a constant current of air, previously passed under pressure through carbolic acid is forced. The strength used is stated to be one in ten, and the lambs are kept in the room for one or two hours at a time; it is said that most of them are thus cured at once.

He assumes that Dr. Koch has demonstrated "to a certainty, that phthisis in man is due to the presence of an entozoon—the bacillus." Therefore he would give the same treatment for phthisis in man as was so successfully used in his cases of parasitic bronchitis of lambs. He would expect "with the greatest confidence" that this treatment would be "equally successful."

Commenting on the above the editor of the Journal says· "No doubt it is highly probable that the bacillus does play some *rôle* more or less important in the development of tuberculosis, but beyond this it seems at present impossible to go. It may, by its entrance into, and development in the tissues, be the direct determining cause of the lesions of tuberculosis; on the other hand, it may be concerned only in the final destructive process, assisting by its growth in the disintegration and removal of the diseased tissues. Very much yet remains to be done before the exact importance of this bacillus can be appreciated.

To compare a nematode worm an inch long with the bacillus tuberculosis, and to assume that what is beneficial to an animal infested with the one, must also cure an individual in which the other exists, is to make a very large assumption, which may or may not be true in this particular case, but is certainly a bad precedent."

In Austria, as well as in Germany and England, systemic efforts are being made to settle the questions as to the contagiousness and heredity of tuberculosis. A circular has been sent to eight thousand medical men in Austria, requesting them to give particulars of any cases which they consider to have proved the contagiousness of the disease, and also to give the particulars of cases of supposed heredity, and of any cases in which complete cure is believed to have been effected. The determined international effort which is being made to cope with this fell disease must be regarded as one of the results of Koch's discovery of the bacillus tuberculosis.

Selections.

Rapid Microscopic Mounting.—Among the most important of the recent improvements in microscopical manipulation are the methods for mounting specimens in consecutive order. For this purpose the specimen is imbedded in paraffin, the hardness of which varies according to the temperature. In winter a softer paraffin must be used than in summer. Experience alone can teach one the exact consistency necessary. The specimen must be thoroughly impregnated with the paraffin as it has to withstand the desiccating effect of the air when exposed in thin sections. This may be accomplished in several ways. The specimen is hardened by any desired manner and placed in absolute alcohol. From this it is transferred to turpentine, or a saturated solution of paraffin in turpentine, benzole or chloroform. After the alcohol has been completely expelled the object is placed in melted paraffin of a low grade and kept there for a considerable time, varying, according to the size of the specimen, from half an hour to several hours. Then it is imbedded in the imbedding paraffin in the usual manner.

After cooling, the paraffin is trimmed to fit the microtome, which must be one of the various forms of the "sledge microtome." Then the portion of the paraffin containing the object is trimmed to a square slightly larger than the specimen, and placed with one of its sides at right angles to the line of the stroke. The knife of the microtome is also placed at right angles to the same line so that the stroke is direct and not a particle "drawing."

The cutting is now done in the usual manner but with a dry razor, and if the paraffin is of the right consistency, the sections will not adhere to the knife nor curl but will form a ribbon, the edges of the sections of paraffin adhering to each other so that they form a ribbon. After cutting a small portion, the ribbon is removed and placed under a bell-glass to prevent being blown away by an accidental draft of air. The cutting is continued until the specimen is entirely converted into sections. Unless both edges of the paraffin block are parallel to each other and to the edge of the razor the ribbon will not be formed.

The slides used also require preparation. There are two methods in use, each having its advantages. The first described employs lac. Bleached lac is dissolved in creasote or absolute alcohol. This is best accomplished by employing freshly bleached lac; though, if this

is not obtainable, the opaque, white interior of older lac will answer. This lac is poured over the slide forming a thin varnish on one side. It is usual to prepare a large number of these slides at once, placing a small label in one corner so as to indicate the varnished side and also the corner in which the series of sections begins. Sometimes difficulty will be experienced in making the coating of varnish transparent but this can readily be obviated by heating the slide slightly immediately before applying the varnish.

Then the ribbons of sections are placed in regular order on the slide after which the slide is exposed to a heat sufficient to melt the paraffin when the sections become affixed to the lac. After cooling, the paraffin is dissolved and washed away by benzole or turpentine; balsam is next placed on the sections and a cover glass placed in position and the slide finished in the usual manner.

This method has the disadvantage that the object must be stained before cutting. A second method admits of staining after the sections are cut and arranged on the slide. Instead of the solution of lac a solution of india-rubber in benzole or chloroform is applied to the slide in the same manner. The subsequent treatment is the same until after the paraffin is dissolved by the turpentine. Next the turpentine is cleaned off by absolute alcohol and then the slide is immersed in any staining fluid desirable. The subsequent processes are those usually employed, dehydration by absolute alcohol, treatment by oil-of-clove and mounting in balsam or dammar.

There are several minor details which add to the convenience of this method. It is desirable to employ larger slides than the regular three inches by one in usual use in this country. The cover glasses also should be larger, and square or rectangular ones are much preferred to round. In placing the sections on the slide it is most convenient to have the rows run first from left to right, next from right to left, etc., as shown in the diagram.

1	2	3	4	5
10	9	8	7	6
11	12	13	14	15
20	19	18	17	16

This adds greatly to the convenience of examination as the sequence is more rapidly followed under the microscope.

These processes are the combined results obtained by several students, the most prominent being Dr. Caldwell, of Cambridge, England, and Professor Giesbrecht, of Naples. These methods have been extensively tested both in this country and in Europe and have been found eminently practical and I commend them from experience to all American students.

J. S. Kingsley, *in Science Record.*

Items.

Mr. Hitchcock says that in England, ordinary slides can be purchased for a shilling each.

In cases where it is desirable to stain sections on the slide they may be attached to the slide by spreading a layer of one part of collodion solution and ¾ parts of oil of cloves over the slide. The sections are arranged on this layer where the oil of cloves is driven off by gentle heat. The sections are then fixed to the slide, and may be treated by various reagents and stained in the usual manner.

With all due respect for the scientific labors of Dr. Koch, and with a weighty appreciation of the potency of these microscopic parasites, we yet fear that this bacillus craze is going too far, and that we are only doing what generations have done before, erecting theories on supposed facts, for our grandchildren to demolish and ridicule.

Epidemic of Trichinosis.—We read in the last issue of *La Gazette Med. de Paris*, that an epidemic of trichinosis is at present raging in Ermsleben, a village in Saxony. Out of 134 houses all but fifty contain individuals affected with the disease. Up to the present time over 200 persons have been attacked and 18 succumbed.

Several of the Parisian savants are about to visit the scene of the epidemic for the purpose of studying the malady.

The Micrococcus of Scarlet Fever.—M. Pohn-Pincus, in the *Gazette Médicale de Paris*,, of Sept. 29, states his belief that he has discovered in the desquamating epidemis of scarlet fever, micrococci which are the germs of this disease. He demonstrates them by partially detaching with scissors a lamella of the epidermis, but so that it shall be still adherent by a great part of its periphery. He then applies to the under surface of the detached portion a few drops of a saturated alcoholic solution of methyl-violet. In a few minutes he scrapes off, with the aid of a cataract needle, some little fragments of tissue, and immerses them for a short time in distilled water; subsequently he places them upon a glass slide, teases them out as finely as possible with needles, and warms the object glass until the preparation is dry. He then adds a drop of oil of cloves, and covers the whole with Canada balsam.

The micrococci will be stained violet. M. Pohn-Pincus says their dimensions are very small, but measurements are not given. They are united in small groups and are found in the depressions upon the borders of the detached cells. No attempt has yet been made to cultivate these micro-organisms or to inoculate them.

AT THE DOCTOR'S EXPENSE.

Dr. Oliver Wendell Holmes calls the dissection room the "Anthropotomic laboratory." The word probably only applies to Boston.

There is a rumor from Germany that a learned chemist has discovered a wonderful oil that will restore youth to old age, etc. It must be a species of O–live oil.—*Philadelphia Bulletin.*

"There is nothing very brilliant about our Bremen dentists," said a lady to a member of the profession in Berlin, "but they are very obliging. If you wish a tooth extracted with gas, they forthwith light the chandelier." [Exc.]

"Diaploma," "diplomy," "diplomer," "diplomah," "diaplemy," "diopluma," "dipluma:" These are seven different ways, according to the files of their State Board of Health, in which Illinois doctors spell the name of the instrument which gives them authority to practice medicine. Let it be hoped that their slaughter may be confined to the Queen's English.

The February Number will contain the index for volume III. We were unable to get it ready for this issue.

Please renew promptly for this volume and thus aid us very materially.

Potassic Iodide for Preserving Infusoria.—Mr. W. S. Kent has found potassic iodide to act in a manner almost identical with osmic acid, and in some instances even more efficiently. The medium possesses the additional advantage of yielding no deleterious exhalations, which have to be carefully guarded against in the use of osmic acid. The formula for preparation is as follows:—Prepare a saturated solution of potassic iodide in distilled water. Saturate this solution with iodine, filter, and dilute to a brown sherry color.

A very small portion only of the fluid is to be added to that containing the infusoria.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

FOR SALE.—Ross Binocular Microscope, 6 objectives and full accessories, cost originally, $650. Address, J. G. Langguth, 135 Wabash Ave., Chicago. Also a large "Beck Binocular, $600 outfit," cheap.

I HAVE quite a collection of histological mounts which I should like to exchange for other good slides. E. M. WATERBURY, M. D., Saratoga Springs, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

A HOMOGENEOUS immersion (works also dry, water or glycerin) 1-15, 180° adjustable, to exchange for a higher power. A. Y. MOORE, 57 Prospect st., Cleveland, Ohio.

FOR SALE OR EXCHANGE for objectives or accessories, one copy Carpenter's "The Microscope and its Revelations," also Dana's "Manual of Geology." Both books are new and latest editions. Cost $10.50. H. F. WEGENER, Denver, Colorado.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

WILL EXCHANGE a June or December, 1881, number of this journal for a February number, 1881, or will pay cash for same. D. M. COOL, Faribault, Minn.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

FOR SALE.—One Tolles' 4-10 objective of 100° adjustable; also one 1½ inch objective of 23° by William Wales. Both made to order and first-class. A. L. WOODWARD, Syracuse, New York.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

I WILL exchange good, histological for other first class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

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CONTENTS.

PAGE.

Original Communications.
- Section Flattener for Dry Section Cutting. By Simon H. Gage and Theobald Smith 25
- The Parabola as an Illuminator for Homogeneous Immersion Objectives. By A. Y. Moore, M. D 27
- Give Credit to Whom Credit is Due. By Prof. Albert McCalla 30
- A Microscopical Incident. By Dr. Alfred C. Stokes 33
- Gleanings from the Journal of the Royal Microscopical Society for December. By C. H. Stowell 35

Correspondence 38

PAGE.

Editorial Department.
- Proceedings of the American Society .. 39
- Important Changes in Business Houses 39
- Another Microspical Journal 40
- Editorial Notes 40

Selections.
- Imbedding in Egg Mass 42
- Rapid Method of Demonstrating the Tubercle Bacillus without the Use of Nitric Acid 43

Items 44

Reviews 46

Exchanges 48

Original Communications.

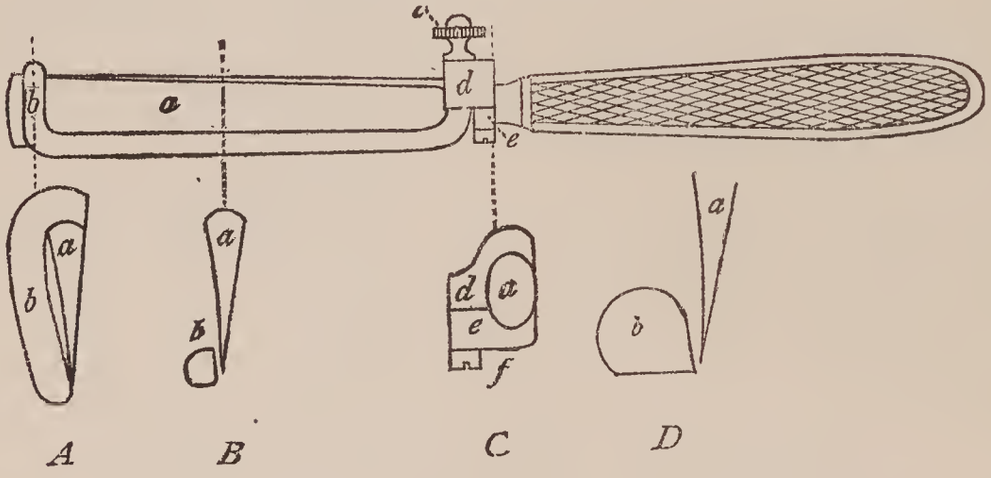
SECTION FLATTENER FOR DRY SECTION CUTTING.
(Note 1 and 2.)

BY SIMON H. GAGE AND THEOBALD SMITH.

IN making sections by the so-called dry method, the curling of the sections has proved the most serious difficulty. This defect in the method is of especial importance when serial sections are made, for in that case *every section must be saved.*

To overcome this difficulty a brush has been recommended, but to use this requires one of the hands of the operator or an assistant. Schultze, as an attachment to the microtome, has devised a spring which rests upon the sections and holds them against the knife as they are cut; but this requires a sliding microtome and hence its application must be somewhat limited (note 3). Our own efforts in solving the problem have been directed toward the composition of the imbedding mass and an attachment to the ordinary section knife or razor, suggested by *Valentine's knife.* This modification consists in replacing the second blade of Valentine's knife by a rod. We

have named the attachment a *Section Flattener* (see Fig. 1, b). It was first attached to a razor and then to a section knife; in both cases it has been found entirely satisfactory, as it prevents the rolling of section even when the object is imbedded in the hardest paraffine. Indeed, in using it the imbedding mass may be safely about three degrees C. higher melting point than is permissible without it. A section knife or razor with this attachment may be used with any microtome or free hand. Besides its special use in preventing the curling of sections, the section flattener serves as a guard to the edge of the knife.



The section flattener consists of a rod (b) of spring brass about 5 mm. in diameter, flattened on two sides (B and D), extending parallel with the edge of the knife and projecting about 2 mm. beyond it. Opposite the cutting edge, the space between the rod and knife is about 1 mm., while nearer the back of the knife the distance is greater (Fig. 1 D, a, b). At each end the rod is bent at right angles. Next the handle it passes through a hollow cylinder (Fig. 1, d), into which it is secured by a milled nut (Fig. 1, c). At the free end of the knife, the rod is hooked over the back of the blade (Fig. 1, A), the spring of the wire securing it firmly. At the two angles of the rod, it rests on the blade so that in cutting sections any amount of pressure may be applied at these points. The rod is attached to the knife by means of a clamp, which consists of two pieces clasping the tang and held together by a screw (Fig. 1 C). To clean the knife and rod, or to remove sections, the rod may be raised as it swings freely in the hollow cylinder attached to (d). The rod may be entirely removed—as is necessary in sharpening the knife—by removing the milled nut (c); the entire apparatus may be removed from the knife by loosening the screw (f).

Fig. 1. The Section Flattener attached to a section knife:

(a) Blade of the section knife; (á) Tang; (b) Section Flattener; (c) Milled nut; (d) The part of the clamp bearing the hollow cylinder; (e) Part of the clamp; (f) Screw holding the two parts of the clamp together.

Fig. 1, A.—Section showing the manner of hooking the Section Flattener over the back of the blade.

Fig. 1, B and D.—Sections showing the form of the Section Flattener and its relation to the cutting edge, except at the ends.

Fig. 1, C.—Section of the tang of the knife, showing the manner of attaching the clamp.

(1) A brief account of this *Section Flattener* is given in our paper (Serial Microscopic Sections) in "The Medical Student" for November, 1883, p. 14.

(2) Since writing this article, our attention has been called to a somewhat similar device by Andres, Giesbrecht and Mayer (Neuerungen in der Schneidetechnic: Mittheil. Zool. Station Neapel, 4 Bd. 3 Hft. (1883) pp. 429—436. An abstract of this paper is published in the Journal of the Royal Microscopical Society for December, 1883, p. 916, and in the December number of the American Naturalist, p. 1312. As our device seems simpler and is applicable to every form of section knife we thought worth while to give this somewhat complete description of it.

(3) F. E. Schultze. Ein Schnitt Strecker, Zool. Anzeiger, 1883, p. 100.

THE CORNELL UNIVERSITY, NOV. 15, 1883.

THE PARABOLA AS AN ILLUMINATOR FOR HOMOGENEOUS IMMERSION OBJECTIVES.

BY A. Y. MOORE, M. D.

THAT the illumination of an object is second in importance only to the glasses through which it is seen, is a fact well known to all practical microscopists; and it is a notable fact that there are about as many different forms of sub-stage condensers as there are objectives. By looking through the various catalogues of microscopes and accessory apparatus it will be seen that a great many immersion achromatic condensers are offered for sale, to many of which a price is attached whose figures are positively forbidding to their purchase by the majority.

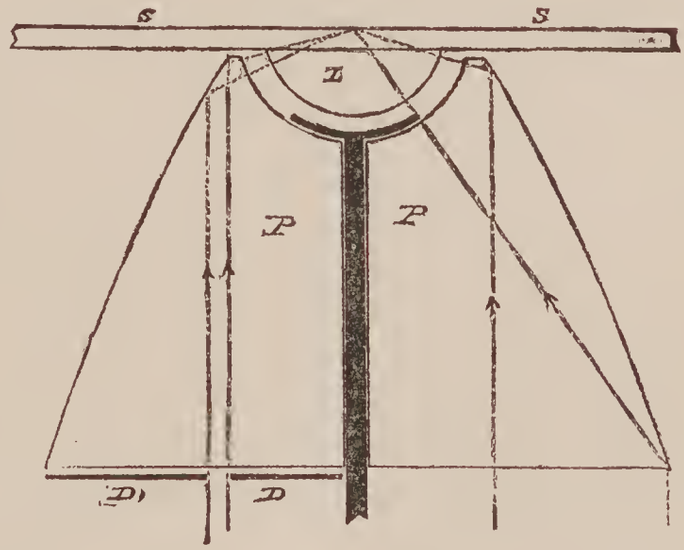
Although many of these wide angled condensers are claimed to bring out the full capabilities of the more recent homogeneous

objectives, they are in no way superior to the ordinary Woodward prism or hemispherical lens, and for this reason, and on account of their cheapness, the prism and lens may be found in the accessory box of almost any one who is in possession of an objective whose angular aperture exceeds the limit of dry working lenses. It may be urged as an objection to the use of the prism or lens, that beams of light from different directions at the same time, are not obtainable; but this objection is overthrown when the light is taken directly from two or more lamps, hence it results that the chief objection is the necessity of having the mirror bar so constructed as to permit of considerable lateral movement. This objection applies only to such stands as are constructed in the old way—that is, to those in which the mirror bar is a fixture and oblique light can not be had from the mirror.

Some time ago the idea occurred to me that the parabola used in connection with a spot lens, might be made to serve a useful purpose in regard to illuminating objects seen with the widest angled objectives; and a few experiments so completely confirmed the idea that I should like to describe the method, so that it may be subjected to trial by others.

The plan is to make two comparatively inexpensive pieces of apparatus take the place and do the work of any first-class wide-angled immersion condenser. These accessories are the ordinary parabola and the hemispherical lens. Ordinarily the former is a dark ground illuminator, but when the aperture of the objective exceeds that of the parabola the effect is simply that of a dry condenser, in which the central rays are stopped out. But even at its best the light cannot traverse the slide at greater angle than 41° from the axis; and it is rarely, if ever, even so great as this. Now, if the light reflected by the parabola could be converted into a glass angle, (commonly called balsam angle) without altering its angular direction, it would be amply sufficient to give light into the objective at the widest balsam angle now used in the best homogeneous immersion objectives. This may be done by using, under the slide, a hemispherical lens, whose radius is less than that of the concavity of the parabola—of course making optical contact by means of the immersion fluid. This is to be accurately centered and the parabola brought up so close that the hemispherical lens will occupy the concavity. When properly adjusted it

will be obvious that those rays which are transmitted by the parabola impinge normally to the surface of the hemispherical lens and hence are not refracted; that is, they traverse the same path in the lens that they had upon the parabola. The effect then, is that of the wide angled immersion condenser with the central rays stopped out. Although this may be very desirable for some objects it is not generally so, and it becomes necessary to limit the direction from which the light comes. This may be very easily accomplished by the use of a cardboard diaphragm. This may be made by cutting a circle of blackened cardboard, the diameter of the inside of the mounting of the parabola, so that when crowded home against the glass surface the circle will be held friction tight. By cutting small holes in this card the light may be regulated; and it should be kept well in mind that when the holes are cut in the outer edge of the card, the light, although oblique, will be more nearly central than when admitted to the reflecting surface through a hole nearer the center; but should the hole be too near the center of the card the light will not be transmitted at all, owing to the fact that it will strike the top of the concavity of the parabola. A good guide to go by is a circle upon the card whose diameter is the same as that of the top of the concavity. The most oblique light may then be obtained by cutting the holes near this line. Holes may be cut at various angles to each other, to effect the resolution of the various sets of lines by which some objects are marked.



In the figure the position of the lens and parabola as regards the slide is shown. S. represents the slide; L. the lens; P. the

parabola, and D. the diaphragm. On the right hand side, the light from the entire aperture of the reflecting surface is represented as reaching the object, as shown by the dotted lines; while on the left, only the most oblique rays are transmitted through a small hole in the cardboard diaphragm.

The chief objection to this method of illumination is, that the central light cannot be obtained, but this, of itself is of no particular account as the parabola may be removed from the substage when it is desired.

As to the performance of this arrangement, I can speak in the highest terms; the resolution of the diatoms of Müller's balsamed plate being easily accomplished; and when the full operation of the parabola was used the dots of No. 18 showed better than I have ever seen them by any other method of illumination.

When used with dry objectives the effect is simply that of dark-ground illumination by very oblique pencils of light.

GIVE CREDIT TO WHOM CREDIT IS DUE.

BY PROF. ALBERT M'CALLA.

ON Page 230 of THE MICROSCOPE of December, you copy from the Chicago Times' report of my Presidential address last August, before the A. S. M., my brief and modest reference to a new form of adjustable nose-piece invented by me, and on page 218 you describe and illustrate the apparatus itself. Unfortunately, however, in this latter reference the name is altered and Mr. Bulloch, with most unrefreshing audacity, claims the entire credit of the invention for himself and utterly ignoring my name, announces that the apparatus has been patented by himself. The contrivance that Mr. Bulloch announces as the "Congress Adjustable Nose-piece" is my own invention throughout, made, drawn and described by me three years ago. Last August I requested Mr. Bulloch to make it up that it might be shown and described at the next meeting of the A. S. M., and be brought into general use. He agreed to do so, and did make it in every essential feature exactly according to the sketches and descriptions I gave him last August, at the Chicago meeting. I intended sending you a full account of the same, with illustrations, in time for the October issue, but a pressure of other duties prevented. (I have been rebuilding my house this fall, while

carrying on my usual burden of college work, and everything has been in such a topsy-turvy state, that writing and drawing have had neither time nor place). I certainly would not have allowed anything to hinder my doing so, had I supposed there was any possibility of Mr. Bulloch patenting my invention, thus placed in his hands, as his own and so publishing it to the world. I had no intention of patenting it myself, or of attempting to realize any pecuniary gain from it, but believing it to be the simplest and most efficient and desirable form of nose-piece yet discovered, I do object most decidedly to having any one attempt thus to deprive me of all the credit of its paternity.

The plan was first worked out by me three years ago and I have shown it from time to time to a number of eminent microscopists. First, at the Detroit meeting of the A. S. M. in 1880, where I showed sketches of it to a number of the members, as Mr. Ed. Pennock, Ed. Bausch, Dr. R. J. Mohr and the said Mr. Bulloch himself, and to many others since. At that time, however, I was anxious to secure its adoption as a means, not only of the rapid interchange of objectives, but also of doing away entirely with the society screw. So startling a proposal from a new member, failed to enlist much support. Now, the invention of Sidle's bayonet-catch nose-piece, Pease's facility nose-piece and Nelson's slotted screw nose-piece, have awakened microscope makers to a realization of the utility of such inventions, and to the fact that the old "Double" and "Triple" and "Quadruple" nose-pieces are not the "*Ultima Thule*" of microscopic invention. Hence, when I determined, last August, to allow the pressure of other matters to no longer hinder me from bringing my invention before the public, and asked Mr. Bulloch to make it up into brass he consented readily enough, although he and others had thought it of little worth three years before. The only change Mr. B. has made from the sketch showed him is in making the slotted collar double thick, so as to hide from view and cover up from touch the slots and pins themselves. This however, is merely a matter of looks and not at all essential. In every other detail and in every essential part the nose-piece is as I drew it for him, and as I have shown it to other microscopists months before. I hope, now that Mr. Bulloch has at last so emphatically endorsed the invention, that others may also undertake its manufacture and use, as I freely gave it to them before.

The plan of my nose-piece is to have a collar or screw on each objective, armed with three equidistant pins or lugs—though two or four would answer also, or still better, and what I hope will be the ultimate outcome of the plan, to have the objective made without society screw, but armed with the 3 pins itself and having the external diameter of 1 in. or 7/8 in. at least, since the society screw is confessedly too small.

Then 2d, let the end of the microscope tube be furnished with 3 slots just wide enough to receive the 3 pins on the objective and say 1/4 in. deep, the slots to be simple and straight, the body-tube to have also a raised ring or rim at the end to retain in place a revolving ring.

3d. A ring to fit over the end of the tube and to be retained in place as above described, and having three slots in it of the shape of an inverted L, and also a milled raised part by which it can be revolved through about a 1/4 revolution. This milled rim may be above or below or outside of the slotted portion of the ring, as the fancy of the maker may dictate.

Preferably and ultimately this should be a permanent part of the microscope to the exclusion of the society screw, and objectives should be made to correspond with a few rings as described above, for adapting old objectives; but, of course, it can be made in the form of an adaptable-fitting with screw to fit in the end of the stands now in use. Now when the milled ring is turned so that the slots in it correspond to those in the inner tube the lugs on the objective slip up easily to the end, then a turn of say quarter of an inch of the ring clamps the objective securely and very firmly. No amount of pulling or twisting at the objective can turn it or loosen it at all, while in ordinary "double nose-pieces" the slightest touch sometimes pushes the objective far to one side of the optical axis, and with every other form of nose-piece now in use the use of the adjustment collar is liable to loosen the objective unless it is screwed in very firmly. Then, too, this nose-piece permits of the most instant interchange of objectives, no other form permitting of a more rapid substitution, and the number that may be so changed is unlimited Any one of your whole battery may be substituted for the lens now on the tube, while with the common double and triple nose-pieces this alteration is limited to one or two others only, and that one or two must be kept sticking out above the stage obstructing manipulation and liable to injury.

These are some of the advantages of the form I have to offer to the world, and which Mr. Bulloch has pirated in such unblushing fashion.

A MICROSCOPICAL INCIDENT.

BY DR. ALFRED C. STOKES.

THE reader is probably familiar with that attractive little rhizopod *Acanthocystis chætophora*, if not by observation at least through Dr. Leidy's monograph on the class. Until the occurrence of a certain event in which it took an interested if not an active part, I thought it as delicate as it is pretty, but I had occasion to change that opinion since the animal showed so much endurance in a struggle it was forced to make.

Acanthocystis is not uncommon in shallow water and among aquatic plants, and, comparing a small thing with a large one, rather ignobly and inaccurately too, it may be likened to a living, vivid green, spherical pin-cushion thrust full of crystalline needles and pins, the heads of the latter not rounded but furcated, with widely diverging rays. This unjust comparison, of course, tells but half the story. The rhizopod is a soft mass of finely granular protoplasm mingled with very many bright green particles, its surface profusely studded with silicious spines rising from minute basal discs, thus giving the animal a rather formidable appearance among its more plainly dressed neighbors. Through the interstices of its armor are protruded the thread-like pseudopodia, and enveloping the whole body is usually an external layer of protoplasm defined by small linear or bacteria-like bodies. The utility of this outer envelope is known only to its possessor.

Recently one of these spinous creatures appeared under my microscope. It seemed to be alive and well, but within it near the armored surface, was a semi-transparent moving something that was too active to have a right there. As the motions of this foreign body became more impulsive it turned completely over and showed itself to be one of the rotifers. In size it equalled not more than one-third the Acanthocystis' diameter, but dwarfish stature was amply compensated by nimbleness.

With a leap, prodigious for so small a creature, the rotifer dashed against the wall and hurled the rhizopod down the field, while

the silicious spines snapped and flew. If the scene was exciting to the spectator, what must it have been to the Acanthocystis, with that jumping Jonah leaping among its vitals? It was no joke to either party. A struggle for life was going on under my very eyes. The rhizopod, with every particle of its jelly-mass surrounding the rotifer possessing digestive power, seemed calm, perhaps with the calmness of despair, but the rotifer—O how she plunged! not a moment did she rest, not a muscle did she leave unused, not a manœuvre untried. The situation appeared a bad one for that rotifer since she bade fair to be digested. She stretched herself and forced out the spinous armor until it seemed on the point of rupture; the Acanthocystis simply flattened the opposite side and waited, digesting. The rotifer leaped, she turned, she pushed with her two sharp toes against the wall; the rhizopod rolled over the field, the spines were loosened and fell off, yet that rotifer remained in the corner where she first appeared, pressed down by the Acanthocystis' body mass, although her efforts were continually nothing less than frantic. For six hours the struggle lasted; from fourteen to twenty o'clock these microscopic creatures were under uninterrupted observation. Finally, after a short rest on the rotifer's part, there occurred one of the most amusing exhibitions of intelligence in these lowly organisms that I have ever seen. It was indeed a masterly piece of strategy. *The rotifer began to eat!* Protoplasmic jelly, chlorophyll corpuscles, half-digested food-particles, everything the Acanthocystis contained streamed down into that rotifer's transparent stomach. With short intervals, which she improved by butting against the wall, she ate until she arrived at the central nucleus when, apparently perceiving that her object was accomplished, she stopped. And then—it really did seem as if she was celebrating her victory—then she laid an egg!

The rhizopod once dead and half empty, the brave rotifer selected the spot at which she intended to leave, and left. It is a curious fact that, having chosen the place for exit, she continued to beat against that point only, until the basal plates were forced aside, and she was free. Circling once or twice around the dead Acanthocystis she darted from the field followed by applause, and a few remarks of approval, from the spectator.

By twenty-four o'clock the ovum that had been extruded in my presence as well as in prison, which I had seen rolling down the half

empty Acanthocystis' sac, had accomplished a part of its internal changes, but an awkward movement displaced the cover-glass and ruined all.

Did that unhappy rhizopod in an absent-minded moment take in an egg, and did that egg eventually take in the rhizopod? Was the development of the egg so far advanced that the rotifer was hatched before it could be digested? Why was it? How was it? Oh, "I want to know, you know!"

GLEANINGS FROM THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY FOR DECEMBER.

C. H. STOWELL.

THE REVOLVER MICROSCOPE AND A DEVICE FOR EXCHANGING OBJECTIVES.—These two objects are mentioned together for this simple reason, that Mr. E. H. Griffith, of Fairport, N. Y., is really entitled to the credit of inventing them. The revolver microscope consists of a circular stage, which can be rotated on its centre and also moved backwards and forwards. The stage, having the pillar of the microscope for its centre, is capable of holding twelve slides, each slide having three mounts upon it. The stage is first placed so that one of the mounts on a slide is in focus and then simple rotation will bring the others successively in view. This is followed by either a forward or backward motion until the second mount on a slide is in focus when the instrument is manipulated as before. It is essentially an exhibition microscope. A number of years ago Mr. Griffith invented practically the same thing and he submitted his drawings to several parties, among them, I believe, was Mr. Gundlach who spoke quite highly of the invention but doubted whether he could make it a paying investment. The device for exchanging objectives, given by Mr. J. Matthews, is on the principal of the cone. An adapter in the form of a hollow cone is screwed into the ordinary nose-piece, with another piece screwing on the objective and coned down exactly to fit inside the first. The only action required then is to push the one into the other, and as they fit accurately there is quite sufficient adherence to keep the objective in its place. Mr. Nelson declares this "to be the best fitting in the world," and he would be glad to see "the whole system of screws swept away and the cone substituted." I remember dis-

tinctly how Mr. Griffith has advocated this method to me for a long time past. He has always been "just going to" get some samples made, but so far as I know he has never put his plans into operation. Mr. Griffith has the common fault of all inventors—it was the fault of the brilliant Spencer—never quite satisfied with his work, and I know to-day, of many things in common use that people would be surprised to learn emanated from this man's inventive mind. Mr. Griffith's compound eye-piece is a perfect surprise, yet somebody else will get the credit of the genius it shows unless he gives it more publicity.

Practical Benefits Conferred by the Microscope.—In the presidential address of Prof. Lankester before the biological section of the British Association for the Advancement of Science, he strongly advocates the endowment of research and referring to the microscope he says: "The microscope, which was a drawing-room toy a hundred years ago, has, in the hands of devoted and gifted students of nature, been the means of giving us knowledge which, on the one hand, has saved thousands of surgical patients from terrible pain and death, and, on the other hand, has laid the foundation of that new philosophy with which the name of Darwin will forever be associated. When Ehrenberg, and later, Dujardin described and figured the various forms of *monas*, *vibrio Spirillum*, and *Bacterium* which their microscopes revealed to them, no one could predict that fifty years later these organisms would be recognized as the cause of that dangerous suppuration of wounds which so often defeated the beneficent efforts of the surgeon, and made an operation in a hospital ward as dangerous to the patient as residence in a plague-stricken city. . . . The amount of death, not to speak of the suffering short of death, which the knowledge of bacteria gained by the microscope has thus averted is incalculable. . . . One other case I may call to mind in which knowledge of the presence of bacteria as the cause of disease has led to successful curative treatment. A not uncommon affliction is inflammation of the bladder, accompanied by ammoniacal decomposition of the urine. Microscopical investigation has shown that this ammoniacal decomposition is entirely due to the activity of a *Bacterium*. Fortunately this *Bacterium* is at once killed by weak solutions of quinine, which can be injected into the bladder without causing any injury or irritation."

CARMINE STAINING.—Obersteiner suggests heating the staining fluid containing the specimens. Specimens hardened for any length of time take coloring matter up so slowly that many days elapse before the process is complete. By subjecting the staining fluid containing the sections to a water-bath heated by a spirit-lamp, the finest staining can be accomplished in from one to two hours, and in the case of hæmatoxylin in even less time. The heating of hardened sections does not injure them in the least when the precaution is used for employing a water-bath.

EYE-PIECE MICROMETER.—The value of an eye-piece micrometer is comparatively slight but still it has its use. Mr. W. M. Bale describes a simple method of making one in the Southern Science Record, an abstract of which may be interesting. He takes as his material fine silk ravelled from a ribbon. Unscrewing the field lens from an objective he applies two small particles of stiff balsam to the lower surface of the diaphragm. Then taking a small portion of the silk fibre he fixes one end in the balsam and then stretching the fibre fastens the other end in the same manner. The field lens is now replaced and the fibre examined and if found straight the next step follows. If not it is replaced by a better piece. The next step which is to attach a second fibre parallel to and at a given distance from the first is a matter of more difficulty. The distance of course will depend on the space to be measured. Assuming that it is to be 1-1000 of an inch with a C eye-piece and a ¼ inch objective it will be about a thirtieth of an inch. The fibre is placed in such a position and then the eye-piece is placed in its proper position in the microscope and with a ¼ inch objective a stage micrometer divided to 1-1000th in. is examined. This will of course reveal whether the fibres of silk are too near or too far apart. If all right a third fibre and so on is attached in the same manner, and examined each time. If one of the lines is improperly placed it must of course be corrected. After the lines are in position Mr. Bale fixes them with slips of gummed paper exercising the greatest care to avoid moving the lines.—*Science Record.*

Correspondence.

Dr. C. H. Stowell:

Dear Sir.—Can you tell me through the Microscope, how exchanges with foreign countries may be effected. I have received no less than 20 vials containing fluids in a single box from Europe, but if I attempt to send one vial, even, packed in cotton in a tightly corked wooden block, it is invariably returned from the U. S. P. O., stamped "liable to injure and deface the mail." Now the U. S. are particularly a young people as regards microscopy. We can learn much from the old world but the P. O. department puts an embargo upon knowledge to be obtained by way of exchanges. It seems to me that this would be a subject worth agitation by microscopists. Perhaps it is one of those ills which must be endured because they cannot be cured, but it certainly seems like an annoyance too great for endurance.

Very respectfully,

Mary A. Booth.

A New Mounting Fluid.—For preserving the cell-contents and the natural color and form of desmids, volvox, and other algæ, I find a mounting fluid made as follows to act well: Dissolve 15 grains of acetate of copper in a mixture of 4 fluid ounces of camphor water, 4 fluid ounces of distilled water, and 20 minims of glacial acetic acid; add 8 fluid ounces of Price's glycerin, and filter. When sections of plant-stems, or other vegetable specimens, are mounted in this fluid the protoplasm is preserved. If, in any case, it is thought desirable to increase or diminish the specific gravity of the preservative, the proportion of glycerin may be changed. Used as above, or modified as indicated, I think it also a trustworthy medium for mounting infusoria and the softer animal tissues.—*Am. Month. Mic. Jour.*

Editorial Department.

PROCEEDINGS OF THE AMERICAN SOCIETY.

THE sixth annual meeting of this society was held at Chicago, August 7th, 8th, 9th and 10th, 1883.

On page 268 are printed these words: *"Remarks were made by Dr. Fell, Prof. McCalla, Mr. Griffith and the Secretary, concerning the proceedings. They thought it desirable to issue the annual volume at as early a date as practicable after adjournment."*

Just *five months* after adjournment the proceedings are mailed to the members and are now before us for review.

The printer has given better work than last year, although in our opinion he should have been authorized to trim the copies as they come from the press. The majority of the members do not have their copies bound, hence the present condition of the copies is both untidy and unhandy.

Must we wait in this way, year after year, for our annual proceedings? Is it necessary to deprive the members of the value of these papers until nearly half of the year has passed by? The proceedings of our State Medical Societies are in the hands of the members in thirty days from the date of adjournment. Had the persons in authority chosen to accept some of our freely offered advice just prior to the last meeting, then we too could have had our proceedings in, at the latest, thirty days from adjournment.

On the other hand great credit is due the publishing committee, and more particularly the secretary, for giving so much of their valuable time to the Society. While they are held responsible for the delay, yet the true source of the trouble rests with one or two authors of papers, who, it seems, think more of their own convenience than they do of the wishes of hundreds of their associates.

Granting that their papers are as valuable as they are lengthy, it is still a question with us, whether by thus delaying the legitimate work of the society, they are in the end an aid or not.

IMPORTANT CHANGES IN BUSINESS HOUSES.

TWO important changes have been made in well known houses since the first of January. The Philadelphia house of R. and J. Beck, so long under the management of Mr. Walmsley, has

been purchased by W. H. Walmsley & Co. Mr. Walmsley has been connected with the house of R. & J. Beck since 1877, and he has conducted all their American business since that time. Therefore the high reputation of the old house will not only be maintained but added to, and the new firm will surely have the success it deserves. Business will be conducted at the same old stand, under the firm name W. H. Walmsley & Co.

Dr. H. H. Chase, of Michigan, has completed such arrangements with H. R. Spencer & Co., of Geneva, N. Y, that he has the sole agency for the sale of all their objectives. Dr. Chase informs us in a private letter that in a few weeks he will have on hand a full supply of objectives. Already he has quite a supply and soon no time will be lost in filling orders. This will be pleasing news to the many admirers of the unrivaled glasses of this house. All orders should be addressed to Dr. H. H. Chase, as given in our advertising columns.

ANOTHER MICROSCOPICAL JOURNAL.

THIS time by the house of Jas. W. Queen & Co. It is a bi-monthly and costs twenty-five cents a year. The first number contains Prof. Duncan's address on "The Abbe theory of Microscopic Vision," "A Highly Refractive Mounting Medium," and several items of interest. Its object as announced in an editorial is to answer the question, "what's new in the microscopic line?" It has seven pages of reading matter, and no doubt will give us in time many valuable points and hints.

It is headed "The Microscopical Bulletin and Optician's Circular." We wish it all the success possible, and express the hope that after it has attained some age it will enlarge its columns.

THOSE who were so fortunate as to read the excellent article by Mr. Griffith, in our December issue, on "Practical Hints," possibly noticed something like a repetition of the method of arranging diatoms. These two descriptions were written by Mr. Griffith at different times and only one of them should have appeared. Sent together by accident, they reached the printer and the repetition was not discovered until too late to be corrected. It was not the mistake of Mr. Griffith; it was not anybody's mistake.

S. E. CASSINO & CO. are soon to issue a translation of Dr. Julius Behren's work entitled "A Complete Guide to the Use of the Microscope in Botanical Research." It will contain four hundred large 8vo pages, and over one hundred illustrations. Every microscopist will await the appearance of the book with the keenest interest. We shall offer the work for sale at club rates in our future numbers.

WE have before us some of the slide-carriers offered by Milton Bradly & Co., in our advertising columns. They are so cheap and simple that all of our subscriber's should send the requisite number of stamps for them.

WE notice that at the last meeting of the American Society of Entomologists, our Secretary, Prof. D. S. Kellicott, was elected President for the ensuing year. In a late number of the Canadian Entomologist Prof. Kellicott has an illustrated article on the external anatomy of the "*Psephenus Lecontei.*"

PLEASE remember that all old subscriptions to volume three have now expired and that for eighty cents you can receive our journal for the balance of this year. It is only eighty cents to you; it is hundreds of dollars to us; it is our success or failure. Please show interest enough to renew promptly. We acknowledge all receipts of money. Do not send any more stamps, but postal notes or money orders.

Selections.

Imbedding in Egg Mass.—Professor Calberla was the first to use successfully the albumen of hens' eggs as an imbedding medium and although the method of procedure has been published for several years, American students have not generally availed themselves of its advantages. The *modus operandi* is as follows:

The whites of several eggs are carefully separated from the yolks and then the fibrous portion known as the chalazeæ is removed and the rest cut up with scissors. Fifteen parts of the white are now vigorously shaken with one part of a ten per cent. solution of carbonate of sodium. The yolk is now added and the shaking repeated, and a subsequent filtering removes the bubbles and fragments of the chalazeæ, etc. A small paper tray of the usual pattern is filled with the resulting fluid and immersed in alcohol which by abstraction of the water coagulates the albumen, forming a solid block.

For imbedding, one of these blocks is taken and washed in water to remove the alcohol and then dried slightly with blotting paper. A small cavity is now scooped out the surfaces of which are wet with the fluid egg. The object to be imbedded is likewise deprived of alcohol by water and is then placed in any desired position in the hollow. Now a drop of alcohol will fasten it firmly by coagulation of the fresh egg. The block is now washed again and fluid egg is poured over to cover the object. To confine this egg it is best to place the object and hardened mass in a box and then pour in the fluid egg. The box and its contents are then to be placed in a vessel and exposed to alcohol steam until the new portion of egg is coagulated. Various plans for thus steaming the preparation have been devised. A convenient and simple method employs a fruit jar in the bottom of which a little alcohol is poured. The box is then placed in the jar and the opening closed with a glass funnel. The whole is now heated in a water bath for from thirty to forty minutes, care being taken that the alcohol does not boil. It is then removed and placed in alcohol which should be changed once or twice in the first twenty-four hours. It may then be cut at any time or the cutting may be suspended and the object kept indefinitely by immersion in alcohol.

The object to be cut should be stained before imbedding but

the sections do not require to be freed from the mass before mounting as the coagulated egg clears perfectly in oil of clove. The mass holds together all parts of the section in the most perfect manner.—*Science Record.*

Rapid Method of Demonstrating the Tubercle Bacillus without the use of Nitric Acid.—The following method, which Dr. H. Gibbes has used for some time with great success, will, he thinks, prove useful to those requiring the demonstration of the tubercle bacillus for diagnostic purposes in a rapid manner. The great advantage consists in doing away with the use of nitric acid.

The stain is made as follows:—Take of rosanilin hydrochloride two grammes, methyl-blue one gramme; rub them up in a glass mortar. Then dissolve anilin oil 3 c.c. in rectified spirit 15 c.c.; add the spirit slowly to the stains until all is dissolved, then slowly add distilled water 15 c.c.; keep in a stoppered bottle.

To use the stain:—The sputum having been dried on the cover-glass in the usual manner, a few drops of the stain are poured into a test-tube and warmed; as soon as steam rises pour into a watch-glass, and place the cover-glass on the stain. Allow it to remain four or five minutes, then wash in methylated spirit until no more color comes away; drain thoroughly and dry, either in the air or over a spirit-lamp. Mount in Canada balsam. The whole process, after the sputum is dried, need not take more than six or seven minutes. This process is also valuable for sections of tissue containing bacilli, as they can be doubly stained without the least trouble. Dr. Gibbes has not tried to do this against time, but has merely placed the sections in the stain and allowed them to remain for some hours, and then transferred them to methylated spirit, where they have been left as long as the color came out. In this way beautiful specimens have been made, without the shrinking which always occurs in the nitric acid process.

Dr. Gibbes subsequently adds:—"This process gives the most satisfactory results, and the horrible nuisance of the nitric acid is avoided. It brings out the bacilli quite as well as the other process, and it stains all putrefactive bacteria and micrococci very deeply, so that in the field of the microscope blue micrococci and bacteria may be compared with the red bacilli of tubercle. The stain can be used cold equally well. The cover-glass in that case must be left in the stain for at least half an hour."—*Royal Microscopical Journal.*

Items.

To Mount Pollen.—If small and transparent—dry. If opaque, in essential oil of lemon or glycerine.

Microscopists will hear with regret of the death, in his eighty-fifth year, of Mr. Hugh Powell, of the firm of Powell & Lealand, opticians.

M. Pasteur has proved that the burial of diseased animals does not destroy the germs of disease, or obviate the chance of infection to any animals who may afterwards feed on the ground above where the body of the diseased animal was buried.—*Science.*

The existence of a micrococcus of pneumonia has been confirmed by Professor Carl Friedländer, of Berlin, who has cultivated these organisms and produced croupous pneumonia by inoculating them in dogs and mice.

A Substitute for a Revolving Table.—Cover of stout oil-cloth to a small table with a round top, drawn underneath the table by strings like the mouth of a bag: the "cover will then revolve with the greatest ease even when it has a considerable weight upon it."—*Sci-Gossip.*

To Mount Moss.—For permanent mounting glycerine jelly is preferable. Rimmington's is very pure and well made. "Immerse the moss in clean water, exactly as it is desired to mount it, quickly transfer to a clean slip, on which is dropped a little jelly sufficiently heated to melt it; place on the cover, and there will be no difficulty in making a good mount, which can be finished off with rings of gold size, and kept as long as desired."

In a report to the Paris Academy of Sciences, the French physiologists, MM. Chambrelen and Malassez, announce that they have at length succeeded in discovering, in the milk of cows affected with inflammation of the spleen, the bacillus of that disease. They have been successful in their experiments in the reproduction of this micro-organism, and in inoculating animals with it.

Mounting Insect Organs, Etc.—Soak in liq. pot. for a day, or longer, if large. Wash and lay out upon the slip, arrange, and gently press while in the water with another slip. Remove to weak

solution of acetic acid for a few hours. Wash again in clean water, and transfer to slip, and drop on spirits of wine; arrange the object and put over another clean slip; gently press and lightly fasten with thread; place end down in a small quantity of spirits of wine for a few hours. Then remove the thread and gently lift off one slip, the whole still wet with the spirit, when the object will adhere to one of the slips; drop on absolute alcohol and work object into centre of slide. Then apply oil of cloves, and in a few hours the object will be ready for the balsam to finish.—*Royal Mic. Jour.*

Dr. Hermann Fol, in studying the Infusoria, found great difficulty in killing these minute objects in an extended condition. Osmic, acetic, chromic, and picrosulphuric acids were tried in vain; finally he succeeded with perchloride of iron. After treatment with this new reagent, the objects are washed with alcohol, and stained with gallic acid, which produces a brownish coloration and renders the nuclei very distinct. The specimens thus treated are mounted in balsam, or, better for observation, in glycerine.

Sad Fate of the Yellow Fever Microbe.—M. Lacerda, of Lisbon, found in the liver and kidneys of yellow fever subjects a parasite, supposed to be the infective principle. Portions of these organs containing the parasite were examined by MM. Cornil and Bebes, but these expert sceptics ascertained that Lacerda's microbe consists of bits of vegetable tissue and pigment.—*Exeunt omnes.*—*Phil. Med. News.*

Reconstruction of Objects from Microscopic Sections.—Born gives an elaborate description of his method of modelling, which is really very simple as well as ingenious. The sections are made with great care, all of the same thickness: they are next drawn with the camera, and the outlines transferred to wax plates, the thickness of which is chosen so as to correspond in relation to the thickness of the sections, as do the outlines to the superficial dimensions of the sections; or, in other words, each wax plate is cut out so as to represent the actual section equally magnified in all three dimensions.—*Science.*

Reviews.

BOTANICAL MICRO-CHEMISTRY; an introduction to the study of Vegetable Histology, prepared for the use of students. By V. A. Poulsen, translated by William Trelease, of the University of Wisconsin. Boston, S. E. Cassino & Co. 1884. $1.00. Pp. 118, small 8vo.

The work before us deals with micro-chemical reagents and their application; mounting media; cements; vegetable substances, and the means of recognizing them. There are a large number of special reagents, and methods given here for the first time.

A careful review of the book enables us to state that it contains all the most valuable reagents used in botanical micro-chemistry. It is only by the use of such reagents that the chemical composition and nature, and even the physical structure of bodies can be recognized.

The second part is devoted exclusively to the various methods of recognizing the different vegetable substances, as cellulose, lignin, starch, coloring matters, etc. The blue color given to starch by the tincture of iodine the author regards "as the result of a (molecular?) solution of the iodine in granulose."

This book is one of those handbooks that will so soon show the result of use—because it will be referred to so often. We recommend it strongly to all workers in vegetable histology.

THE HUMAN BODY; an elementary text-book of Anatomy, Physiology, and Hygiene. By H. Newell Martin, M. A., M. D., Professor of Biology in Johns Hopkins University. New York: Henry Holt, & Co. 1883. Pp. 335, pl. 4. Ill. $1:00

This is the second volume in the "American Scientific Series, Briefer Course." As Professor Martin succeeded so well in his larger work it is not a surprise to find the abridgement also equally well adapted to the class demanding it. It is no simple matter—we know of scarcely anything more difficult—for an author to write a work that shall be at the same time both scientific and easily comprehensible. This text-book contains clear, simple language, without in the least being superficial.

At the foot of each page is a list of questions to enable the student to test whether he has mastered his lesson.

To aid the teacher in his work there are directions accompanying each chapter for demonstrating the main outlines in anatomy, and for physiological experiments, including vivisections on the frog. As a text-book for schools and academies it appears to completely fill the vacant place. It is clear and comprehensible, scholarly and scientific.

THE RETAIL DRUGGIST'S DIARY AND WANT BOOK. Frederick Stearns & Co. Detroit. 1884.

This book, as seen by the title, is especially adapted to the wants of the druggist, although there are in it quantities of items of general value. It contains sixteen pages of important tables, a large quantity of scientific and political information, fifty-two pages of diary with space for each day of the year for entering memoranda, twelve pages for entering wants and purchases and a large number of pages of priced catalogues. This handy arrangement shows a good deal of labor and will be appreciated by all interested in the retail drug trade.

THE ATLANTIC MONTHLY. Houghton, Mifflin & Co., Boston.

The volume for 1884 starts with a very vigorous and fresh serial story "A Roman Singer," which will run through the first six numbers of the year. It is the most welcome of news that during the year Oliver Wendell Holmes will contribute frequently to the volume. He now writes exclusively for The Atlantic. The first installment of Dr. Weir Mitchell's serial, "In War Times," appears in the January number. This volume promises to be rich in all varieties of literary excellence.

THE CENTURY. Midwinter number, February, 1884. The Century Co., Union Square N. Y.

The midwinter number of this superior magazine is filled with the rarest and choicest material. Among the illustrations are "The Head of a Man," by Rembrandt, engraved by T. Johnson; a portrait of Sheridan by the same engraver, and portraits of Dante. The wood-engraving art is shown to a fine degree in this number. It is surprising what the Century gives us in this line. Geo. B. McClellan, Geo. W. Cable, Edmund C. Stedman, and Salvini all contribute to make this a number hard to be excelled.

MICROMETRY. Reprint from Proceedings of the American Society of Microscopists. 1883.

INTRODUCTORY ADDRESS, Delivered before the Medical Class of Dartmouth College. 1883. By Louis Elsberg, A. M., M. D.

MONEY AND THE MECHANISM OF EXCHANGE. By Prof. W. Stanley Jevons, F. R. S. Complete in two parts, 15 cents each, post free. J. Fitzgerald, Publisher, 20 Lafayette Place, New York. For sale by Willis Boughton, Ann Arbor, Mich.

This valuable and most timely treatise, from the pen of one of the foremost contemporary writers on finance, should be perused by every thoughtful citizen. The account of the Mechanism of Exchange here given is singularly full and instructive.

ON THE BRAIN OF A CAT LACKING THE CALLOSUM. By Burt G. Wilder, M. D. Pp. 10. Illustrated.

THE STANDARD NATURAL HISTORY. Prospectus. Six volumes. Imperial octavo. Fully illustrated. Editors-in-Chief, Elliot Coues, M. D., and J. S. Kingsley. For prospectus apply to S. E. Cassino & Co., Boston.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

I HAVE quite a collection of histological mounts which I should like to exchange for other good slides. E. M. WATERBURY, M. D., Saratoga Springs, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

A HOMOGENEOUS immersion (works also dry, water or glycerin) 1-15, 180° adjustable, to exchange for a higher power. A. Y. MOORE, 57 Prospect st., Cleveland, Ohio.

FOR SALE OR EXCHANGE for objectives or accessories, one copy Carpenter's "The Microscope and its Revelations," also Dana's "Manual of Geology." Both books are new and latest editions. Cost $10.50. H. F. WEGENER, Denver, Colorado.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

FOR SALE.—One Tolles' 4-10 objective of 100° adjustable; also one 1½ inch objective of 23° by William Wales. Both made to order and first-class. A. L. WOODWARD, Syracuse, New York.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, &c., &c. J. O. STILLSON, 504 Upper 2d St., Evansville, Indiana.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, Ph. D., Cortland, N. Y.

I WILL exchange good, histological for other first class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

FOR EXCHANGE—A Tolles 1-15 inch immersion 104°—170° adjustable, to exchange for lower powers. J. B. MARVIN, 903 4th ave., Louisville, Ky.

WANTED—Nos. 1 and 2, of volume 2, this journal, to complete set for binding. MARY F. HALL, Dayton, Ohio.

THE MONTHLY
MICROSCOPE
ILLUSTRATED.

VOL. IV. ANN ARBOR, MARCH, 1884. No. 3.
WHOLE NO. 20.

Original Communications.

STUDIES IN HISTOLOGY.

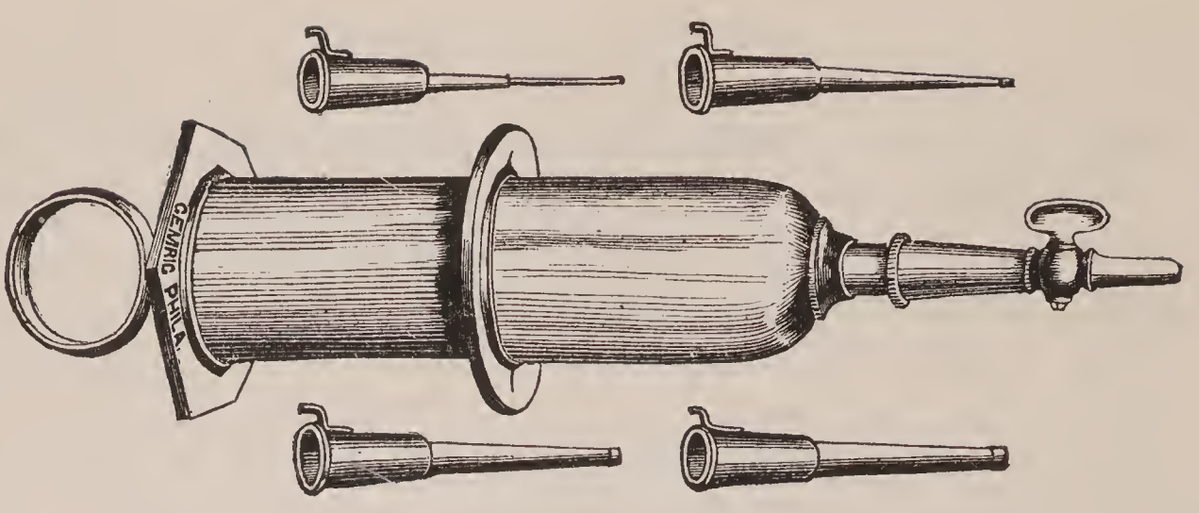
C. H. STOWELL.

Lesson I.

INJECTING.

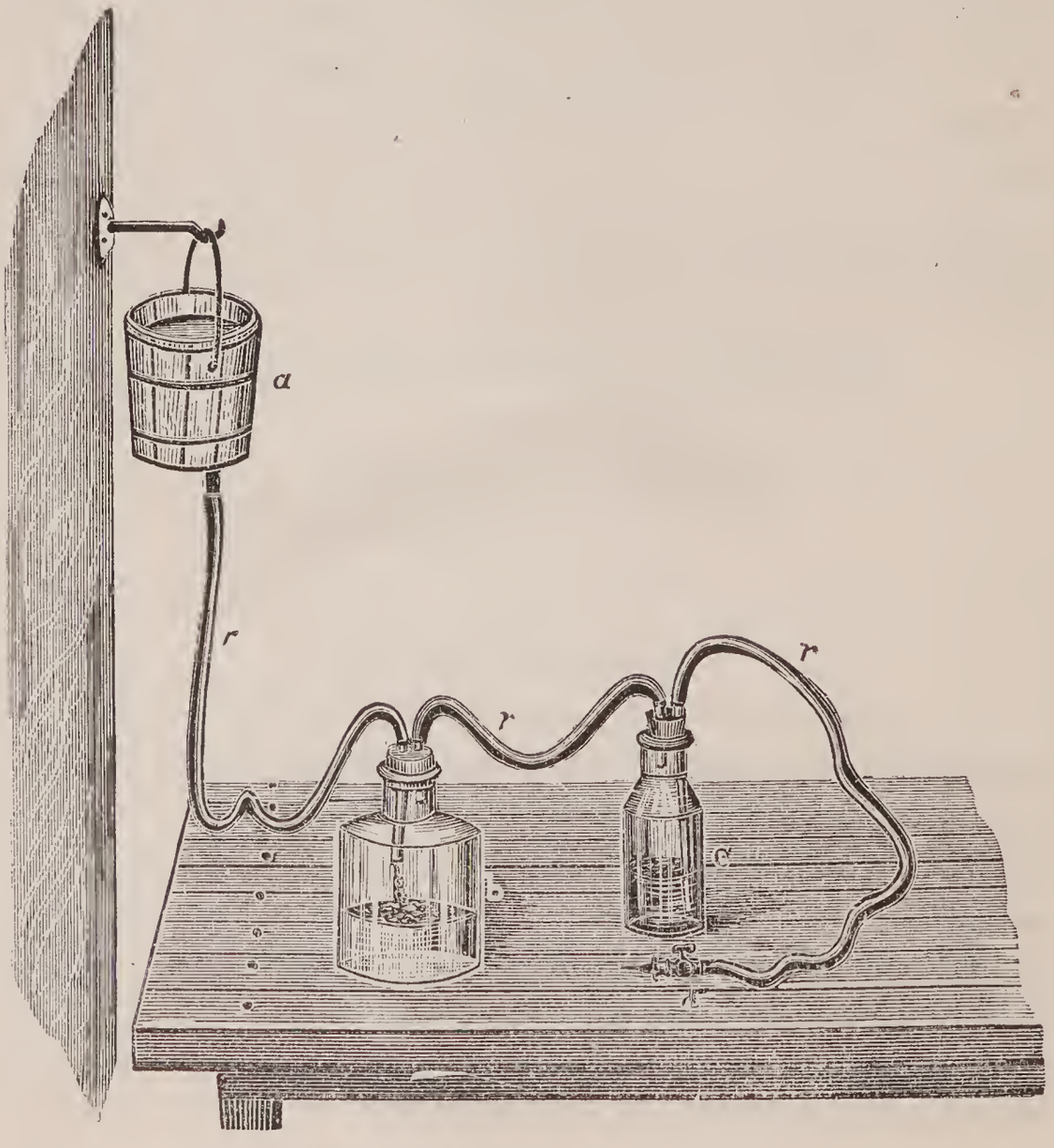
If a volume were written on this subject, it would not render the aid that a few actual trials would give. Nothing so good as experience here. However, first of all get a good syringe with pipes and stopcocks. Some knives, scissors, forceps, and thread should be close at hand. Two or three "bull-nose forceps" are very convenient and save a good deal of time in catching up and holding firmly a ruptured vessel.

A syringe of brass with different pipes as seen in the figure can be purchased for about nine dollars.

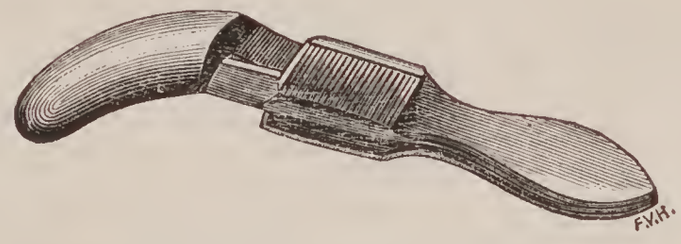


A cheap injecting apparatus can be made according to the illustration as follows:

A, represents a pail partly filled with water, which can be raised or lowered, to regulate the pressure, by fastening one end of a cord to the handle of the pail and then passing the other end over a pulley fastened to the ceiling of the room; *b*, is a



bottle with an air-tight fitting cork, pierced by two short glass tubes; *c*, is a bottle partly filled with the injecting mixture. Through the cork of this bottle are two glass tubes, one of which is short, while the other reaches very nearly to the bottom of the bottle; *d*, is a brass nozzle with a stop-cock; *r*, is a rubber tubing, which unites the different parts as seen in the figure. A y-shaped glass tube can be inserted midway in the rubber tube between the two bottles, so that two bottles of the injecting mixture can be attached to the one large bottle, b, which is empty at first. A third glass tube can be placed in the cork of the bottle *c*, which can be united by rubber tubing to a u-shaped glass tube partly filled with mercury, and thus the amount of pressure obtained. By raising the pail, the water descends the rubber tubing and compresses the air in the bottle, *b*. The air is forced through the middle piece of rubber tubing and presses on the top of the injecting mixture in the bottle, *c*, which is forced up the glass tube, along the rubber tube to the canula, and into the animal or organ to be injected. If the force is not sufficient to fully inject the vessels, then the rubber tube can be detached from the pail of water and slipped over the end of a common Davidson's syringe. With the aid of the bulb of the syringe, water can be forced into the first bottle, *b*, sufficiently to give all the pressure desirable.



GENERAL DIRECTIONS.

1. Find the vessel you wish to inject and with the scissors cut a v-shaped opening in its walls, or with a knife make a longitudinal slit. This is preferable to introducing the pipe directly in the end of a vessel, something almost impossible to do in the case of small vessels. The pipe should be filled with the injecting fluid before inserting it in the vessel. After filling, it is thrust in and tied round with silk, care being taken to bring the ends of the thread back around the hook on the pipe, so that there may be no danger of withdrawing it before the operation

is complete. All vessels communicating with the one connected with the pipe must now be tied with silk. Some vessels that have escaped notice will be discovered as soon as the injecting mixture commences to flow. The "bull-nose forceps" will catch them up firmly. Turn the stop-cock now and remove the body of the syringe. Be sure that the syringe is in proper order and that it fills well with the mixture. Just before bringing the syringe in contact with the pipe it is best to force out a drop or two in order to get rid of all the air. Fit it tightly now to the pipe in the preparation, turn the stop cock, and with a firm pressure empty the syringe of about three-fourths of its contents, again refill and inject until the operation is complete. The pipe containing the stop-cock should be left on the pipe that is inserted in the preparation. Nothing but experience will enable one to tell when the operation is complete. The beginner will be quite liable to cease operations too soon rather than too late.

INJECTING MIXTURES.

Blood vessels are best filled with a fluid which becomes solid in ordinary temperatures. Gelatine forms the foundation of such mixtures, for it can be liquified at blood heat and it solidifies at a little lower temperature. It is easily cut and coloring matter mixes readily with it. When gelatine masses are used, of course they must be kept hot while in use and the preparations to be injected must likewise be kept warm, generally by placing them in hot water. However, if a recently killed animal is to be injected, the heat of the body itself will be found sufficient to keep the hot injecting mass in a fluid state. After using these mixtures the preparation is placed in cold water long enough to allow the gelatine to set when it is divided into parts as required, and placed in equal parts of water and alcohol or other hardening media.

SEILER'S CARMINE GELATINE.

This is a very desirable injecting mass. It is best to purchase it of dealers in microscopical accessories, as it is difficult to prepare. It sells for one dollar an ounce, and an ounce of the gelatine is dissolved in ten ounces of water.

It is prepared as follows:

Best carmine	2 drachms.
Distilled water	3 ounces.
Strong liquor ammonia	20 drops.

Dissolve this and filter through cotton, covering the funnel with a piece of glass plate, to prevent the evaporation of the ammonia.

Cox's gelatine	2 drachms.
Distilled water	2 ounces.

Soak the gelatine in the water until it becomes soft, and then dissolve it in a water bath and strain through fine flannel while hot. Heat the gelatine solution again and add the carmine solution. Bring the temperature up to 100° F. and add dilute acetic acid, drop by drop, under constant stirring, until the ammonia is neutralized, or until the solution changes from a lilac to a scarlet color.

CARTER'S MASS.

Carmine	60 grains.	
Strong ammonia	120 minims.	
Glacial acetic acid	86 minims.	
Solution of gelatine	Glyc. 1 part Water 6 parts	2.0z.
Water	1½ ounces.	

Dissolve the carmine in the ammonia and water with the aid of gentle heat, and filter; add to this 1½ ounces of hot gelatine solution, and mix thoroughly. Add the acid to the remaining ½ ounce of gelatine solution, and drop this into the heated carmine mixture, with constant stirring.

There are several modifications of Carter's formula, all seeking a better way of neutralizing the ammonia.

BLUE MASS.

Soluble Prussian blue	4 drachms.
Gelatine	4 ounces.
Distilled water	20 ounces.

Treat the gelatine the same as in making the carmine mass, using half the water; then add the Prussian blue dissolved in the other half of the water, keeping both solutions hot, and constantly stirring while cooling is going on.

BEALE'S PRUSSIAN BLUE.

This is used for making transparent injections, and certainly for exhibiting fine vessels under high powers it has no equal. The bright color is permanently retained if the hardening reagents be made slightly acid; or if preserved in a fluid, this also should have a little free acid added to it. It is prepared as follows:

Common glycerine	1 ounce.
Alcohol	1 ounce.
Ferrocyanide of potassium	12 grains.
Tincture perchloride iron	1 drachm.
Water	4 ounces.

The ferrocyanide of potassium is to be dissolved in one ounce of the water and glycerine, and the tincture of iron (muriated tincture of iron) added to another ounce. These solutions should be mixed together very gradually and well shaken in a bottle. The iron being added to the solution of the ferrocyanide of potassium. When thoroughly mixed, the solutions should produce a dark blue mixture, in which no precipitate or flocculi are observable. Next the spirit and the water are to be added very gradually, the mixture being constantly shaken in a large stoppered bottle. In cases, in which a very fine injection is to be made for examination with the highest powers, half the quantity of iron and ferrocyanide of potassium may be used.

BEALE'S ACID CARMINE INJECTING FLUID.

Carmine	5 grains.
Glycerine, with 8 or 10 drops of acetic or hydrochloric acid	½ ounce.
Glycerine	1 ounce.
Alcohol	2 drachms.
Ammonia	a few drops.

Mix the carmine with a few drops of water and, when well incorporated, add about five drops of liquor ammoniæ. To this dark-red solution about half an ounce of the glycerine is to be added, and the whole well shaken in a bottle. Next, very gradually pour in the acid glycerine, frequently shaking the bottle during admixture. Test the mixture with blue litmus paper, and if not of a very decidedly acid reaction, a few drops

more of acid may be added to the remainder of the glycerine, and mix as before. Lastly, mix the alcohol and water very gradually, shaking the bottle thoroughly after adding each successive portion till the whole is mixed.

INJECTING KIDNEYS.

Inject first the kidney of a pig or sheep, using the carmine gelatine mass. Try a second kidney with both the carmine and blue masses; injecting the arteries red and the veins blue.

INJECTING A FROG.

Wrap the frog in a napkin to protect the tissues and kill by dashing with some force against the table. Introduce one blade of the scissors carefully beneath the sternum and cut it through the median line. Slit open the pericardium. Cut an opening in the ventricle. Do not wait long for the blood to escape but wash it away as it appears with water. Introduce the filled pipe of the syringe, and secure firmly in place by passing the thread around the heart substance and back over the pin on the nozzle. Just the end of the pipe only should be included for if thrust in too far, there is great danger of the point passing through the delicate coats of the vessel. Try Beale's transparent Prussian blue.

INJECTING A FISH.

Cut off the tail of the fish and introduce the pipe of the syringe into the divided vessel situated just beneath the spinal column. The pipe need not be tied. Use the Prussian transparent blue.

INJECTING A CAT.

Cover with a large funnel and place a small sponge saturated with chloroform in the chamber with the animal. When thoroughly under the influence of the anæsthetic, remove to a board, place on the back and secure the extremities firmly with strong twine fastened to nails, previously driven in the board. Fasten the head firmly by a regular gag or by twine. Do not let the animal die yet; keep administering the chloroform on a sponge held over the mouth as occasion requires. The usual method is to remove the sternum by cutting the intercostal cartilages on either side and injecting from the heart. To do

this, cut through the pericardium and make an incision through each of the ventricles of the heart. Secure the pipe in the left ventricle and proceed. Toward the last, close the opening in the right ventricle. Use Seiler's carmine gelatine.

INJECTING FROM THE CAROTID ARTERY.

A much neater way to perform the above operation is to inject from the carotid artery down toward the heart. I have repeatedly tried this with good results. It can be so neatly performed that scarcely any blood is lost save that collected in the beaker.

First cut down and expose the large artery and vein of the neck. Either dissect the vein out for a little distance and then cut it and hold the cut extremity over a beaker, or better introduce into the vein a small glass tube. Bleeding will freely occur through it. If a clot stops the flow, remove the tube and wash it out or introduce a wire and break it up. Then securing the filled nozzle in the carotid vessel. A small portion of the vessel is included between two clamps—flattened, bent wire—and a longitudianal slit made through its walls. After the pipe is well secured a small quantity of the carmine mass is slowly introduced. The beat of the heart itself will push the mixture on until this first small quantity is seen to color the gums and eyelids. Proceed as directed until the operation is complete; until considerable force is necessary to empty the syringe. Toward the latter part of the operation it may be desirable to open the abdominal cavity in order that the organs may protrude and become completely filled with the injection mass.

When the gelatine has set, the tissues may be removed and hardened after the regular methods.

AN ANIMAL OR PLANT?

T. B. REDDING.

ENCLOSED find a drawing of an object that I observed last night under very favorable circumstances. I had often seen specimens of the same under the microscope, but they were always in a still condition, and would so remain for days. Last

night, however, while examining a drop of water from a large tank in my greenhouse, I found a very large specimen, $\frac{1}{85}$ of an inch in diameter, which I examined with a one-fifth objective and with 2-inch, 1 inch, and $\frac{1}{2}$-inch eye-pieces, of best make. When I first saw it, it was in the position shown in Figure 1.

Fig. 1 Fig. 2

Its flagella was in very active motion most of the time, and was probably twice as long in proportion as the drawing shows. While I was looking, suddenly, and without the slightest warning, it disappeared backward beyond the field of view by an impulsive jerking motion. I immediately followed it up and found it in position and shape shown by Figure 2; but in two or three minutes it had again assumed the shape shown in Figure 1. Its flagella was in constant motion. Time and again it disappeared and changed shape. The large nucleus is of a light brown color, with a highly refractive nucleolus in centre. Immediately forward of, and partly under the nucleus there seemed to be another nucleus. Surrounding the nucleus were many green cells, with an open free place in the rear of the nucleus. Greenish lines seemed to be produced by folds in the outer covering, and ran longitudinally, but following the out-

line of the body. The tail, in Fig. 2, was slightly twisted at its junction with the body. No internal movements could be detected.

I have nothing at hand by which I can determine name, genera, or species. Is it an animal, or plant? What is it? The flagella is inserted in a slight depression or mouth. I could not see that any food entered the body.

THE CONGRESS NOSE-PIECE.

W. H. BULLOCH.

In reply to Prof McCalla's letter in reference to the Congress Nose-piece, I would say I have always given him the credit of suggesting the idea, but it is one thing to suggest, and another to put into practical shape. Prof. McCalla claims to have drawings and sketches of a nose-piece as invented three years ago; and to have exhibited them to myself and several others at the Detroit meeting. As I can only answer for myself, he never showed any drawings to me, or in my presence there, or at any other time. And as I did not hear his address in Chicago, having other matters to attend to, I did not know anything about his reference to a nouse-piece until one or two days after he read his address. According to the proceedings of the A. S. M., page 16, he is reported to have said: "Mr. Bulloch promises to have some specimens of this form ready to show at our next meeting." The above remarks had no right to be put in the proceedings of the society. They are not in the official report of the meeting as given in the Chicago *Times*, Aug. 8th. And, as I said above, I knew nothing of his idea until one or two days after. Whether Prof. McCalla asked me to make a nose-piece or not, I cannot say; but when we were in general conversation around the table, E. Bausch, E. Pennoch, W. J. Lewis and others being present, Prof. McCalla mentioned his idea about a bayonet catch nose-piece. And I said: "I understand what is wanted. *Will work it out*; and have one that can be shown at the next meeting.' There were some sketches made on the table, but any other drawings or sketches I have never seen. If he desired me to make a nose-piece ac-

cording to his idea, it was not at all necessary for me to "*work it out.*" He should have furnished the full drawing with description. I do not believe that he has any drawings that an ordinary mechanic could use and be able to make a nose-piece from. He says, "after some months" I made one, and sent it to him, with letter for his approval and further suggestions. The letter above referred to is dated Oct. 30th. The meeting was from the 9th to the 10th of August, which he calls "some months." In my letter to Prof. McCalla, I said: "I have just sent you, by mail, one of the new Congress nose-pieces, which I have *perfected* from the idea suggested by you. I think you will admit that it is the best one that has been brought out. I made two or three different styles before I was satisfied." If any person can make out, in the above, that I wished for any suggestions, so as to improve it, he is greatly mistaken. Prof. McCalla's answer to the above by postal, is as follows: "Yours rec'd. ann the N. P. also. Many thanks. It is quite perfect. Will write more fully next time." It is hardly reasonable to suppose that I would be wanting suggestions, when the application for patent was filed Sept. 22nd, six weeks previous to the date of the above letter. And the patent granted three days before he wrote the above postal card.

The microscopists of this country are under great obligations to Prof. McCalla for his generous contributions for the improvement of the microscope. He says that he had "perfected his idea *three years ago*," But he did not take the opportunity to write a description, which need not have taken ten minutes of his valuable time. He waited until I put his crude idea into practical shape, which cost me time and money, and now claims all the credit. By his statement he says that he showed the drawings and described his invention three years ago, and some of the persons he claims to have shown them to, are practical opticians, but if he did, no one thought it of any consequence, for they never saw any details, and very little of what was said can now be remembered. Two of the persons that he names in his letter, say they never saw any drawings. His whole letter has too many branches of Washington Cherry Tree spread through it. And his very liberal offer to the manufacturers of this country is thrown on barren ground. It would

be much more to his credit to copy a description of his so-called invention, if he has any that was composed previous to seeing my improvement. He must understand that the suggestions of improvement are not patentable; but that they must be put into practical shape either by intelligable drawings, models or otherwise.

If I have "pirated"* McCalla's "form," I certainly have not hidden my light under a bushel. I have given to the microscopic world the pirate spoils, which it might never have possessed and enjoyed had it not been for my zeal in the persecution of the enterprize which had been so many years in developing; and which only "practical inventive genius" could prepare for the public good.

THE MEASUREMENT OF BLOOD-CORPUSCLES.

C. H. STOWELL.

SOME of our exchanges have had considerable to say lately about the size of the human red blood-corpuscle, and about the "standard measurements" in general. Mr. Vorce urges that we abandon the recognized standard measurement of this corpuscle as $\frac{1}{3200}$ of an inch. I do not think that this urging is at all necessary, for the "standard measurement" was dropped as such long ago. Mr. Vorce "ventures the opinion that such a standard will be found to be nearer to $\frac{1}{3400}$ of an inch than is generally suspected."

I publicly ventured this same opinion over six years ago. It is stated in the first edition of my histology that my own observations gave the $\frac{1}{3367}$ of an inch as the average size of these corpuscles. Now I believe that the size of the red blood-corpuscles of man is not far from $\frac{1}{3400}$ of an inch. I also believe that a large number of measurements of the corpuscles of the dog will not vary greatly from this size even under the most favorable conditions. I cannot understand how it can be true, as Mr. Vorce says, that "between some observers the difference will amount to nearly five per cent.," unless indeed the magnifying power be comparatively low. With a cobweb eye-piece micrometer and a $\frac{1}{30}$ or $\frac{1}{50}$ objective, the measurements can be so delicate that an error of 5 per cent. can hardly be imagined

* THE MICROSCOPE, page 30, February 1884.

to occur with experienced observers. At the close of a recent article on this subject by Dr. Up de Graff, of Elmira, in which he assumes that the new standard of $\frac{1}{3400}$ of an inch is nearer correct than the old $\frac{1}{3200}$ of an inch, he says: "Would not the prevailing difference in size still exist—as shown by Gulliver—when measured by Mr. Vorce? If not, why not?" Mr. Hitchcock replies: "Certainly the relative sizes would be the same."

I am not so sure about this conclusion. We know more to-day about the human blood, because we have better instruments, and because we study it far more, than Gulliver did. Gulliver studied the blood of many animals. We are principally engaged, it would seem, in studying the blood of man. Study the blood of the dog, the horse, and the pig, as thoroughly as human blood has been studied, and perhaps the ratio may be changed. It does not seem to me that "certainly" the relative sizes would be the same. Here is a little proof on that point. Gulliver said: Man, $\frac{1}{3200}$, Dog, $\frac{1}{3642}$, Hog, $\frac{1}{4230}$. Now Woodward says: "The mean average of 1,766 corpuscles of human blood ranged from .000,309 to .000,343 of an English inch. Nearly the same number of corpuscles of dog's blood gave .000,296 to .000,340 of an inch." Is not the proportion changed here?

Elsberg says the mean diameter of the red corpuscle of man is .0075 mm.

Welcker says the average diameter of the corpuscles of the cat is .0065 mm.

Has the ratio been retained here by modern observers?

Welcker says the mean diameter of the corpuscles of the cat is .0065 mm., and of the rabbit .0069. Gulliver said they were: Cat, $\frac{1}{4404}$; Rabbit, $\frac{1}{3607}$. Has the ratio been maintained?

We assert that—"If Mr. Vorce should apply his micrometer to the human corpuscles and find them to measure $\frac{1}{3400}$ of an inch," instead of $\frac{1}{3200}$, he would not necessarily "find also, by the same rule, the pig's to measure $\frac{1}{4400}$ of an inch." The relative sizes need not necessarily be the same. So now I will "venture an opinion." It is this: As soon as microscopists pay as much attention to the blood of the lower animals as they have already given to human blood, it will be found that the relative sizes of the red blood-corpuscles as given by Gulliver are incorrect.

WHITE ZINC CEMENT.

C. H. STOWELL.

"White zinc cement has been much used, and is, unfortunately, still employed to some extent. It is a very pleasing cement to work with, but all we can say of it is that if the preparer wishes to be assured that a certain proportion of his mounts will be spoiled sooner or later by the running in of the cement, let him use the white zinc." —R. Hitchcock, in February No. of *American Monthly Microscopical Journal.*

WHITE zinc cement is not only the most pleasing cement to work with, but is also as durable as any cement in the market. Nothing can take its place for a glycerine mount. A recent writer has said that "only the careless and slovenly have trouble with their cells breaking when white zinc is used as the cement." Neither will it run in and spoil the mount if it is properly put on.

I have a few slides that show where the cement has run in, but these are caused directly by my own haste or carelessness.

If our readers know of any cement better for glycerine mounts I should like to have them make it known.

I use it altogether in laboratory work for balsam mounts also. Here more care is needed to make a neat looking finish, but in the end we have a durable and also attractive mount. After mounting in balsam, a thin layer of colorless marine glue is placed around the edge of the cover, just coating the exposed balsam. This dries very quickly; when dry, a thin layer of the white zinc is put on and the mount is then laid aside for a few days. The second coat of zinc will finish the slide in good shape, and none of it will run in either.

The colorless marine glue is dissolved in fusel oil, and is unaffected by benzole, hence it serves as a perfect wall between the benzole of the zinc and the soluble balsam within.

Of course some of our students have occasional trouble with the running of the zinc, but then—poor students, haste, inattentiveness to details; these always must result in poor mounts. Brunswick black, gold size, Brown's rubber cement, Bell's cement, they are all good; but *white zinc is the cement for every day use.*

OUR THIRD ANNUAL SOIREE.

C. H. STOWELL.

THE students of the Microscopical Laboratories of the University, under the direction of the Editors of this journal, gave their third annual soiree on the evening of February 8th, in University Hall. Eighty five exhibitors explained their specimens to over 600 people. The following is copied from the first page of the programme for that evening:

"The number on the programme corresponds to the number of the Microscope. The exhibitors will be pleased to explain each specimen to any one who may request it of them. Please consult the glossary on the fourth page. By referring to the programme it will be noticed that all the specimens will be changed at 8:45.

The University owns 120 compound microscopes. Their present value is estimated at over $6,000. Not included in this estimate are a large number of extra glasses and accessories, among these is a Spencer one-fiftieth objective now valued at $250, also a large Beck binocular "International" microscope stand valued at $400, recently purchased. In the "Microscopical" laboratory practical instruction is given in the study of vegetable histology, in pharmacology and in the detection with the microscope of adulterations of foods and drugs. In the "Histological" laboratory the minute structure of the more important tissues and organs of the body is studied. The exhibitors this evening represent about one-fourth of the whole number of studentss who are engaged each college year in this work. Last year the student prepared over 5,000 of these mounted preparations for their own use. It is proper to state that a large number of the specimens exhibited this evening are of a popular character and do not represent the work of students in the laboratories."

We have a few of these programmes left, (not over a dozen) and if any society is interested in giving soirees we will gladly mail them a copy for inspection. We copy the following from *Every Saturday* of Detroit:

"Notwithstanding the inclement weather a large crowd was present at the soiree of the Microscopical Society. The seats had been removed from the large lecture room of the main hall, middle college,

and long rows of tables, each holding a lamp and two microscopes, were arranged on the floor. The hall outside was filled with tables, also each with its attendant, bedecked with a bouquet and repeating over his explanation of the slide, as each new sight-seer bent over the instrument and gazed on the wonders of the minute. Fifty instruments were in operation, each one numbered, and a printed program was given at the door, enabling the visitors to have a clear understanding of the specimens. The slides were all changed at a quarter to nine, and a new program presented. Among the finest specimens, and those which pleased the visitors most, were sections of grape-stems, butterfly's wings, trichinæ spirais, Brazilian beetle, and the views with polarized light. The circulation of the blood was beautifully shown in the membrane of a frog's foot and in the gills of a living menobranchus. Our boarding-houses were represented by some specimens of buckwheat batter containing live eels. Dr. Stowell and his accomplished wife were managers of the exhibition, and received many compliments for its success. President and Mrs. Angell, a large number of the professors and their wives, the best citizens in Ann Arbor and the very *elite* of the student community, were present."

HOW TO KEEP LIVING INFUSORIA.

J. M. ADAMS.

DR. A. C. STOKES, of Trenton, N. J., has luckily hit upon the right method of sending infusoria, although it may not be new to some. Lemna plants are used, which keep the water sweet and supply oxygen while in transit. This alga is so easily cultivated, harby, prolific, and so well adapted for this use, that none need despair of sending infusoria alive hereafter.

AMERICAN SOCIETY OF MICROSCOPISTS.

THE Executive Committee has decided to call the next annual meeting of the Society in Rochester, N. Y., Tuesday, August 19, 1884. Local arrangements for the convenience of those in attendance are already being made. Circulars of information will be issued in due time by the officers of the Society and by the local committee.

D. S. KELLICOTT, Secretary, Buffalo, N. Y.

THE FROGS.

I wrote to a friend asking if he could procure a frog for me to use at our third annual soiree, as I wished to show the circulation of blood in the foot. The frogs came, and with them the following reply, which is too good to be lost.—ED.

Victorious at last! Too late, though, I guess,
Yet I'll forward the trophies to-day by express;
May they be to your classes, specimens neat,
In showing, in fact, circulation complete.

One question I'll ask in closing my tale,
If you're able to answer, please do so by mail;
Does the microscope tell, with all its big show,
How these little *Ranæ* from tadpoles do grow?

In dropping their tails and putting out feet,
In changing from black to colors so neat?
Please answer this letter if ever you can,
I'll read it to Arthur, he'll then be a man. D. P. S.

Editorial Department.

OUR NEW PUBLISHERS.

FOR three years this journal has been issued from the publishing house of Geo. S. Davis, of Detroit. Now that we appear once a month, it was found impossible to have the printing done so far from the editorial rooms. It has been placed, therefore, in the hands of the *Courier* publishing establishment, of this city.

Although Mr. Davis is at the head of an immense mercantile business, and is largely responsible for its financial success, yet he has always exhibited the liveliest interest in purely scientific matters. He has been most liberal to fully compensate those whom he has engaged to pursue original inquiries, and thus has been the cause of placing on record many valuable results. As the publisher of our books he has been more ready to make great outlays than we were willing to accept. He has just made us the liberal offer—which has been accepted

—to destroy all the old plates of our "Manual of Histology," and allow us to thoroughly revise the work and make as many new illustrations as the text warrants, for the *third edition.*

The friendship thus formed has been more than a business one, and we have nothing but the most pleasant associations to recall.

OUR NEW ADVERTISERS.

MR. GRUNOW appears again in our advertising pages. He never intended to leave them, but through our own neglect to ask him to renew, the advertisement was dropped. He is prepared to furnish his new camera lucida, which has attracted such universal commendation, for twelve dollars. We call attention to his new "No. I" microscope, and also to the fact that he can furnish Abbé's new illuminating apparatus complete for $22.00.

WE have always taken pride in the fact that our journal has almost invariably been issued from the press on time. The delay in this issue comes from a change in our place of printing, and was unavoidable. We do not expect it to occur again.

ONE of the brightest and "newsiest" journals that comes to our table is THE MICROSCOPE, now a monthly.

—*Monthly Bulletin.*

Be careful, Mr. Editor. This partakes of the "*familiar, colloquial*" style; it has completely ruined this journal (in Mr. Hitchcock's eyes).

"SCIENCE RECORD" is a good journal, but we are sorry to find that soon it will have poured upon it the wrath of the Washingtonian production. *It has nearly a column of "Facetiæ"*! We were told to omit these "as having no proper place in such a journal." If the *Record* does not do so, we fear its subscription list will be largely increased.

WE take pleasure in calling the attention of our readers to the Facility Nosepiece which is advertised in this number for the first time. We have one on our own microscope, and shall have them on all the microscopes in our laboratory as soon as possible.

WE are surprised to learn, through a private letter from Mr. Cole, of London, that the subscription list to his publications is practically nothing in this country. "The Methods of Microscopical Research," "Studies in Microscopical Science," and "Popular Microscopical Studies," all are edited by Mr. Cole, and issued weekly. It is the most complete and valuable series of "studies" ever published, and should have a generous support by American microscopists. The editor will send a complete prospectus free. Address, Arthur C. Cole, F.R.M.S., St. Domingo House, Oxford Gardens, Notting Hill, London, W., England.

EDITORIAL EXCERPTS.

C. H. STOWELL.

THE GERM OF SWINE-PLAGUE.

IN a lengthy article in *Science*, for Feb. 8, 1884, the writer gives an abundance of facts to prove that Klein is not entitled to the discovery of germ of the swine-plague. The author, D. E. Salmon, concludes by saying:

"It is a matter of record, therefore, that the organism which constitutes the cause of swine-plague was first discovered by Klein in 1876, but that he failed to connect it in any way with the virus of the disease, and afterwards concluded that it depended upon a very different schizophyte. It is also a matter of record that I was the first to demonstrate by satisfactory methods that this micrococcus exists in the blood during the life of the animal, that it can be cultivated in flasks, and that the sixth successive cultivation, made in considerable quantities of liquid, and which contained no other form than micrococcus, still produced the disease. Neither Pasteur and Thuillier, nor

any other investigators that I am aware of, have added one particle of evidence, except by way of confirmation, to that previously advanced by me. M. Pasteur is usually very particular in giving credit, but he does not seem to be keeping up with the progress of American science."

THE BACILLUS OF TUBERCLE.

In a recent number of the weekly *Medical Review* is an editorial on this subject. It urges physicians to become familiar with the look of this parasite, and to treat the whole question as one "which the general practitioner can no longer conscientiously ignore."

The writer relates the following case, which is the first of the kind that has come to our notice:

"There is further a business aspect of the case which we have not yet seen referred to, namely; the examination of doubtful cases of this kind when applying for life insurance. This is matter of so much financial importance to the managers of the insurance business that we are astonished that they have not yet made the matter obligatory on the part of their examining physicians at any rate in doubtful cases. This question was the more forcibly brought to our minds some eight months ago, when a patient presented himself, complaining of some catarrhal difficulty. He manifested symptoms relating to the conformation of the chest which were markedly suspicious of phthisis, and in the course of investigation he stated that he had lately been thoroughly examined by the life insurance company for an increase of $10,000 in his policy. The examining physician making the remark at the time that he ought to be consumptive but that he failed to detect the proof of it. The examination of the sputum, however, revealed unquestionably the presence of the bacillus. Even supposing the insurance companies did not see fit to act upon such at present the record of such feats would be of great value in determining the average duration of life, after the development of such a phenomenon."

THE NEW MORPHOLOGICAL ELEMENT OF THE BLOOD.

A very satisfactory account of this is given in *Science*, for Jan. 11, 1884. Hayem names the new cells, hematoblasts, but

Bizzozero calls them blood-plates, and this is by far the preferable term.

"On account of the quickness with which they are destroyed after the blood has escaped from the vessels, it is necessary to make use of certain preservative liquids which have the power of fixing these corpuscles in their normal shape. The solution recommended by Hayem is composed, of water 200 parts, sodium chloride 1 part, sodium sulphate 5 parts, and mercuric chloride .50 parts. Bizzozero recommends a .75% solution of sodium chloride, to which some methyl aniline violet has been added. Osmic-acid solution, 1%, may also be used. To obtain good specimens of the blood-plates, the following method is suggested by Laker. A drop of preservative liquid is placed on the slide, and a drop of blood on the cover-slip, and the slip laid quickly on the slide, so that the two drops come in contact. As many as possible of the red corpuscles are then drained off by means of a piece of filter-paper applied to the slip on the side opposite to the drop of preservative liquid; or the two drops may be placed on the slide, and the cover-slip laid on from the slide of the preservative liquid. The one precaution which it is necessary to observe is to lose as little time as possible in transferring the blood to the preservative liquid.

Obtained in this way, the blood-plates of the mammal are small, non-nucleated, discoid bodies from one-fourth to one-half the size of the red corpuscles. Hayem states that they are bi-concave, like the red corpuscles, and that many of them have a slight greenish or yellowish color due to the presence of haemoglobin. Bizzozero, on the other hand, maintains that they are perfectly colorless and not bi-concave.

They are about forty times more numerous than the white corpuscles. In their general behavior toward reagents they resemble the nucleus of the white corpuscles, according to Laker. Hayem states his reasons for believing that they are finally transformed into red corpuscles. They play a most important part in the congulation of the blood. In brief, it may be said to be proven that there is, around a thread, first, a deposition of these plates; second, their fusion into a granular mass; and third, the formation of fibrine. The origin of thrombi in blood vessels is attributed to the destruction of these corpuscles.

Reviews.

THE WONDERS OF PLANT LIFE UNDER THE MICROSCOPE. By Sophie Bledsoe Herrick. 12 mo., pp. 245. Fig. 85. G. P. Putnam's Sons, New York, 1883.

The above embraces a collection of articles that the author had published in *Scribner's Monthly*, with a number of chapters added. The work is divided into ten chapters, commencing properly with "The Beginnings of Life, and Single Celled Plants," and closing with the higher forms of the "Insectivorous Plants." There is nothing more curious and interesting in itself than a study of these same insectivorous plants, and by the clear explanation given much has been done to popularize these favorites of Darwin. The author has had her usual happy style in presenting her subject, and the book is not only interesting as a book, but it has a permanent value as well. The illustrations are in the highest style of the art and the binding of the best quality, with bevelled-edge cover embossed in gold. A handsome book for the centre-table; a valuable one for the library of the microscopist.

THE KINGDOMS OF NATURE, OR LIFE AND ORGANIZATION FROM THE ELEMENTS TO MAN. By Ransom Dexter, A. M., M. D., LL. D., late Professor of Zoölogy in the University of Chicago. Large 8 vo., pp. 515. Fully illustrated. 1884: Fairbanks, Palmer & Co., Chicago.

Just how to present the leading facts in Natural History in an intelligible manner to the average reader and yet keep within the bounds of science, is no small task in itself. The author tells us that his work was written for popular use, and it certainly deserves a very popular use. Commencing with the low forms of life, as the bacteria and fungi, it follows on to the highest intelligence. A chapter "On the Relations of the Face to the Axis of the Body" is decidedly interesting. "The relation of the face to the axis of the body is the typical expression or exponent of the relative strength of the physical and mental factors and their mutual relations upon each other." It is one

of the handsomest books we have ever seen. The engravings are profuse and finely executed. It is printed on heavy paper. The cover is beautifully embossed in gold and thus made attractive when on the shelf or library table. The illustration on the cover, showing the relation of the face to the axis of the body is both unique and telling.

WORLD-LIFE AND COMPARATIVE GEOLOGY. By Alexander Winchell, LL. D., Professor of Geology and Paleontology in the University of Michigan. Second edition. Illustrated, pp. 642. 12 mo. cloth. Price, $2.50. S. C. Griggs & Co., Chicago.

It is always with delight that we peruse the fascinating works of this author. He may simply present a great storehouse of facts and opinions, yet it will be done in such a manner that the keenest interest will be excited. To one unfamiliar with the awful grandeur of our universe, the startling statements of the writer, stupefy with amazement. "Seven and one-half millions of meteors bright enough to be seen by the naked eye, pass through our atmosphere, on an average, every twenty-four hours, and this number must be increased to four hundred million if those be included which a telescope would reveal." We read of "Nebular life," "A cooling planet, "The Earth," "The condition of the fixed stars," and we have our curiosity still more excited as we peruse the pages that speculate upon the "habitability of other worlds." Impressed on every page is the profound learning of the author, yet so grand and simple is the style that whole chapters read like a romance. We are accustomed to study the growth and decay of a *microscopic germ*, but the author tells us here of the growth and decay of *worlds*. He takes us from the nebulous mass diffused through space to suns and worlds, and then shows us their final dissolution. It is a book to be read rapidly with satisfaction; it is a text-book to be carefully studied. Such a portrayal of the grand system of the universe must leave the reader "with a profound impression of the ominpresence and supremacy of one intelligence."

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

I HAVE quite a collection of histological mounts which I should like to exchange for other good slides. E. M. WATERBURY, M. D., Saratoga Springs, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

HAVE a large number of histological mounts for exchange. T. B. STOWELL, PH. D., Cortland, N. Y.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

A LARGE number of histological specimens, handsomely mounted, for exchange for any kind of mounts for the microscope. G. A. SPRECHER, M. D., Oakland, Cal.

I HAVE a 1-11 in. objective made by Verick, works either wet or dry. When the front system is removed it becomes a fine ¼ suitable for tissues. Has society screw and brass box. I wish to exchange it for a Remington Rifle, 22 caliber. Must be first-class gun. J. O. STILLSON, 504 Upper Second street, Evansville, Ind.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc. W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

A HOMOGENEOUS immersion (works also dry, water or glycerin) 1-15, 180° adjustable, to exchange for a higher power. A. Y. MOORE, 57 Prospect street, Cleveland, Ohio.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, 504 Upper Second street, Evansville, Indiana.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, APRIL, 1884. No. 4.
WHOLE NO. 21.

Original Communications.

ASTASIA HÆMATODES.

BY T. B. REDDING, A. M., PH. D.

IN the January number of THE MICROSCOPE, 1884, I observe that Professor Lockwood speaks of the *Astasia Hæmatodes* as a hitherto unknown infusorian in the new world. As an addition to information upon that subject, allow me to say that I found it here about five years ago in a bayou about five miles from this place, in small quantity, presenting the appearance described by Prof. Lockwood. Three years ago last summer I found it in great abundance in my fish pond, containing about one-eighth of an acre, which is supplied by spring water conducted through gravel and tile. It varies in depth from a few inches to 6 feet. The outlet is at the bottom of the deepest part, hence there is no current through it. It is exposed to the full effects of the sun, not having any shade. Sometimes nearly half of the pond has been covered with a scum of a blood red

color varying in thickness from a mere pellicle to probably one-eighth of an inch. The upper surface of the thick scum looks like bright red dust. I have also often observed deposits of the *astasia* on the bottom of the pond where the water was shallow and still. They have regularly appeared in great abundance each summer since their first appearance, and probably will appear again the coming summer or fall. I commenced a study of their life history last September, but did not complete it; will resume again next fall, if they appear. I have kept them in small aquarias for several weeks very successfully. I also deposited a large number of them in a tank, in my greenhouse, holding about ten barrels of water and where the temperature of the air never goes below 60° F., hoping to be able to continue my investigations during the winter, but so far they seem to keep out of sight, and I find none of them that I can recognize with certainty, although, within a day or so past, a form has appeared very similar in some respects, but having very rapid motions and a distinct mouth, and with ends more nearly the segment of a circle.

I had supposed the astasia a common object, but the suggestion that it is new to this part of the world invests it with new interest.

My greenhouse tank is supplying an immense amount of interesting microscopical life, and possibly I shall favor you hereafter with some of the results of studies from that quarter.

NEWCASTLE, Ind., January 24, 1884.

MICROSCOPY ONE HUNDRED AND FIFTY YEARS AGO.

E. A. CONGDON.

TO understand the progress of the study of microscopy, it is interesting to go back to its earlier periods and compare its aims and statements as represented by writers of those by-gone times with its present position, and its fund of knowledge accumulated since that time, when its earnest students gave their statements to the scientific world. "Baker on the Microscope," written in 1740, now seems to us quaint, full of peculiar ideas, and wanting in the definite knowledge which the investigations

of the present day have developed into positive facts; and yet we must remember that one hundred years hence our own boasted knowledge may be severely criticised by the scientific world of the future, and we in our turn may have to undergo the same test of comparison which we now apply to this work.

Speaking of objects for the microscope, Baker tells us: "Proper Objects for the Microscope are exceeding small Bodies, exceeding small Pores, and exceeding small Motions." The solutions of practical problems by means of the microscope were not thought of in those days, Bacteria were unknown, and Diatoms and Desmids, now such common objects for the microscope, but little known.

The character and structure of blood was not at all well understood. We are told: "Human Blood, and the Blood of Land Animals, is found by the Microscope to consist of round red Globules, floating in a transparent Water and Serum. Each red Globule is made up of six smaller Globules, and each of these again is composed of six Globules still more minute, so that every common red Globule is composed of at least 36 smaller ones." He speaks very enthusiastically of the circulation of blood, but the manner of seeing it must have been very unsatisfactory. A glass tube was taken, and into it was squeezed a frog, newt, or any other small animal, and so a view of the circulation in the more transparent parts was obtained. What would one of these earnest microscopists, who thus laboriously viewed this most wonderful sight, have said, if he could have seen the circulation in the web of a frog's foot, through one of our modern instruments! Have seen the "*frog plate*," and the frog, neatly tied up in a little bundle, with the toes stretched out with fine cords!

The ideas concerning "animalcules" were very misty, everything of small size found in water being placed under that head. In Baker's plates of "animalcules" are seen Diatoms, Infusorians, Crustaceans, and larval forms of beetles, dragonflies, etc. He describes a *Navicula* under the name of "Oat Animal." He says: "This Creature is so very small, that no true judgment can be made of it, unless it be looked at through the greatest magnifier, nor even then without considerable attention. I commonly found two or three in a drop of the sedi-

ment, lying at the bottom of the water, without any Motion or visible Motion or Life, being enclosed in a bi-valve Shell, which the animal can open or shut as it is inclined."

Speaking of the markings on the shell, he says: "Several of them have a couple of very dark round spots, one whereof is seemingly placed on each side of the Shell." He does not quite know what these "dark round spots" are. He "imagined them to be compact Ligaments, serving to open and shut the Shell, and corresponding to those of the Oysters, Muscles, Scallops, &c." Or he supposes them to be "concreted Bodies, similar to the Pearls bred in several kinds of Shell-Fish."

Obtaining microscopic life by means of *infusions* was well known at that time. The idea of "Pepper-Water" may be new to some microscopists. "Put common black Pepper, grossly bruised into an open Vessel, to cover the bottom of it about half an inch or thereabouts, in thickness, and pour thereon Rain or River Water, till it rises above the Pepper one inch." After a while a scum forms which contains "millions of Animalcules, scarce discernable at first even by the greatest Magnifier, but continually growing bigger, till they come to their full size."

Among the most interesting microscopes in vogue at that time, were the "Double Reflecting Microscope" and the "Scroll Microscope." The first named is a clumsy, awkward affair. It consists of a large tube supported by three brass pillars rising from a wooden pedestal. A smaller tube slides into the larger one, and from its bottom a still smaller one, to the end of which are screwed the "magnifiers," i. e., *objectives*. At the top of the large tube is an eye-piece. There is a circular plate of brass, fixed horizontally between the three pillars and below the larger tube, which serves as a stage. Below this stage in the base of the instrument is fixed a mirror, free to turn on its own axis, but fixed.

Such was the microscope of the 18th century. Compare this instrument with one of the present day, and one can see what enormous strides microscopy has made during the last 150 years.

The "Scroll Microscope" was merely a pocket, simple microscope, fixed on a scroll of brass and illuminated by a mirror.

THE BACILLUS OF GLANDERS.

NEW MOUNTING MEDIUM.

AT a regular meeting of the State Microscopical Society of Illinois, held February 8th, 1884, Dr. H. J. Detmers, gave a very interesting account of a case of glanders, showing the bacillus of the same, which is quite similar to the bacillus tuberculosus, but larger. He had examined the discharges from the deceased animal and found many micrococci which were formerly supposed to be the cause of glanders, but he could account for these in this case, as the stable in which the horses were kept was very dirty, accounting for the presence of many forms of bacteria, etc.

The bacillus of glanders is stained by methyl violet, not by ordinary staining fluids.

In the course of his remarks, the doctor referred to, and exhibited the bacillus found by Prof. Burrill as the cause of a disease of the roots of the strawberry plant.

Mr. B. W. Thomas showed some slides prepared by Prof. Hamilton Smith, mounted in his new medium. The following is the report of the committee appointed to examine the slides:

To the State Microscopical Society:

Your committee to which was referred the slides of diatomaceæ mounted in a new media prepared by Prof. H. L. Smith, of Geneva, New York, respectfully report as follows:

Your committee carefully examined the slides submitted to them but gave special attention to the slides of amphiplura pellucida mounted in a nearly white or colorless medium whose refractive index is stated to be 2—.

A new Bullock professional stand with a ten inch tube was used. It was fitted with a condenser made on the Abbe pattern by Mr. Bullock, the numerical aperture of which was stated by the maker to be 1-23. The condenser was used with a homogeneous immersion fluid, (cadmium chloride in glycerine.) The illumination was furnished by a kerosene lamp with a flat wick turned edgwise toward the mirror, and the light was reflected through the condenser by the concave mirror.

The objectives used were, first, a dry 1-6 of Bausch and Lomb, said to be of 140° air angle with, a Beck No. 3 eye-piece, which gives a supra amplification of 13 88. The angle of light from the condenser

was as high as could be used by the objectives and fully illuminate the object and with these appliances the lines showed with great distinctness.

We then used an homogeneous immersion—Zeiss 1-18 numerical aperture—1-28 with the following eye-pieces: Beck No 1, supra amplification, 5; Beck No. 2, supra amplification, 8.33. Tolles 1 in. supra amplification, 10; Beck No. 3, supra amplification, 13.88; Tolles ½ inch supra amplification 20.83. The illumination was the same except that the angle of light was as oblique as the condenser could give. With all of these eye-pieces the *beads* showed very strongly.

The slide mounted in a yellowish medium with a refractive index said to be 2.3, did not seem to present any marked superiority over the other.

Your committee would expect these media, particularly the colorless one, to be of great value if they keep well. Their advantage in the study of diatoms is obvious. We would also expect them to be even more useful in histology if preparations can be transferred to them without injury. They may also be of great service in the study of bacteria.

By the process of staining, now necessary in the study of these structures they are shrivelled and perhaps changed in other ways, and we may hope to learn much more about them than is now known if they can be studied in these media in a more natural condition.

Respectfully submitted,

B. W. THOMAS.
LESTER CURTIS.
H. A. JOHNSON.
H. W. FULLER.
H. J. DETMERS.

HOW TO MOUNT CASTS.

E. E. JACKSON.

HERE is my method for preparing and mounting casts. It is simple and the result is good. If you think from specimens sent it is worthy publishing, do so.

After allowing urine to settle, pour off and wash sediment repeatedly with clean water, the object being to get rid of the albumen. The white sediment consists of casts and epithelia. Have ready a solution of eosin 5 grs. to 1 oz. (water 3, alcohol 1), pour it on sediment, allow to stand 30 minutes, then wash

repeatedly as long as color comes freely. Allow to settle, place a drop on cover, when dry enough to adhere, rinse off with alcohol to get rid of water, dry. Wet with spirits of turpentine and mount as usual in Balsam.

I have followed green on the red with good results, foreign matter will dye bright green before the red leaves the casts.

In using green alone, I find the casts and epithelium stain a purplish blue, while much foreign matter (dust) will be a bright green. In this case color will distinguish a cast if form does not. Hope some of your readers will make a trial.

BACILLUS STAINING.

C. H. STOWELL.

WE copy the following from a circular issued by W. H. Walmsley & Co., giving a list of their staining reagents:

FOR STAINING AND PREPARING SPUTUM FOR DETECTION OF BACILLUS TUBERCULOSUS.

Obtain fresh sputum—coughed up in the morning. Spread a small portion upon one surface of a thin cover glass and dry in the air. Pour a few drops of the *Magenta* stain into a watch-glass. Hold the watch-glass over a spirit lamp for a few seconds until the stain becomes warm, and place the cover glass, sputum downward, upon its surface—leave it in for five to ten minutes—then wash it in dilute Nitric acid (1 to 3) until all color perceptible to the eye has disappeared. Wash in distilled water to remove all traces of acid. Then float the glass, sputum downward, for two or three minutes upon a few drops of *Methyl Blue* stain—again wash in distilled water—then immerse in absolute alcohol for a few minutes to remove all trace of water. Dry thoroughly in the air.

If the Magenta Stain be used cold the cover-glass must be left in it for half an hour.

When dry, place a drop of Balsam solution on the cover-glass and lay it carefully on a glass slide. If wanted for examination at once or with oil immersion, run Hollis' glue round the edges of the cover.

FOR STAINING BACILLUS TUBERCULOSUS WITH DR. GIBBES' DOUBLE STAIN.

Pour a little Stain into a test tube and warm; as soon as it begins to steam, pour into a watch-glass and invert the cover-glass with the Sputum on the Stain; allow it to remain for five minutes, then wash in Methylated Spirit until no more color comes away; dry and mount in Balsam solution.

FOR STAINING ALL OTHER BACTERIA.

For *Fluids*, such as Urine, Pus, Sputum, etc., containing Bacteria, spread a small portion of the fluid on one surface of a cover-glass, and dry in air. Warm over a spirit lamp to make it adhere. Float the cover-glass, object downward, on small quantity of the *New Purple Stain*. Hold the watch-glass over a spirit lamp for a few seconds until the Stain becomes warm, leave for five minutes. Then wash in Spirits, dry, and mount in Balsam solution.

If the Stain be used cold, the cover-glass must be left in for half an hour.

STUDIES IN HISTOLOGY.

LESSON II.

BY C. H. STOWELL.

HARDENING, SOFTENING, DISSOCIATING AND NORMAL FLUIDS.

NEARLY all of the animal tissues require hardening; a few require softening; while others have to be examined in some normal fluid medium.

The tissues should be as fresh as possible and should be cut at once into small pieces. The size of the pieces will depend upon the penetrating power of the hardening fluid, "Müller's fluid" being remarkable in this respect.

Portions of such solid organs as the liver and kidney need not be cut into pieces smaller than an inch square, while portions of such tissues as the stomach, œsophagus, intestine, and spinal cord need not be cut only sufficient to handle them conveniently, if Müller's fluid be used.

An abundance of the hardening fluid should be used, at least twenty or thirty times the bulk of the tissue. If any foreign matters are to be removed, wash the tissue carefully with a stream of saline solution.

It should be borne in mind that tissues may be over-hardened as well as not sufficiently hardened. When over-hardened they will be brittle and crumble; they may be so hardened that they are spoiled for cutting and staining. If they are not hard enough they feel elastic like rubber, when slightly pressed between the thumb and forefinger. When tissue has to be transferred from one hardening reagent to another it should be removed from the first when it is still in this tough and elastic condition. In changing a tissue to complete its hardening in alcohol all the first hardening medium should be washed away by soaking the tissue in water, frequently changing the water until it is no more colored by the hardening reagent.

Tissues are hardened by coagulating the albumen and extracting the water, hence hardening causes shrinking. It is desirable that this shrinking take place as little as possible, at the same time it should be gradual that it may be uniform. It is a general rule, then, in using all hardening reagents that cause marked shrinking of the tissue, to commence with weaker and advance to stronger solutions.

It is very important to have each bottle with its contents, labelled with a letter or number, with a corresponding mark in a note book. The note book should tell the kind of animal, the tissue, date of injecting, of changing or substituting fluids, and any facts of special interest.

HARDENING REAGENTS.

Potassic Bichromate	2 parts.	By weight.
Sodic Sulphate	1 part.	
Water	100 parts.	

This fluid has great penetrating power, and is admirably adapted for hardening and preserving nearly all the tissues of the body. It slowly coagulates the albumen without extracting the water and causes but slight shrinking. It is a cheap mixture and specimens may be preserved in it for an indefinite time without losing any of their characteristics.

Specimens should be allowed to remain in the fluid at least two weeks, during which time they should be removed to fresh solutions three or four times, after which it is not necessary to disturb them.

At the end of the two weeks, or after a longer time if desired, the tissue is well washed in distilled water until no more color comes from it. It is then transferred to some hardening fluid of greater power, usually alcohol. The alcohol should be quite dilute for the first two or three days; then common alcohol takes its place for the next two or three days, when absolute alcohol completes the hardening in from two to three days more, the time depending upon the size of the specimen, the nature of the tissue and other factors. This is the most satisfactory of all the general methods of hardening. It insures even shrinking and hardening and leaves the tissue in good condition for cutting and staining, and besides there is not the danger of injuring the specimens that accompanies the hardening process of some regents.

MÜLLER'S FLUID AND ALCOHOL.

Müller's fluid	3 parts.
Alcohol	1 part.

This mixture is used especially for the brain, spinal cord, and retina. After frequent changes as described above, the hardening is completed in alcohol.

It should be made only as required and should be kept in a dark place.

MÜLLER'S FLUID AND NINETY-FIVE PER CENT. ALCOHOL.

Dr. Seiler recommends a solution composed of equal parts of these regents, claiming that large organs, as whole kidneys, brains, etc., may be hardened throughout in a comparatively short time.

ALCOHOL.

Alcohol is very generally used to commence and complete the hardening of tissues. The pieces of tissue should be quite small or the whole organ must be injected with the alcohol. It is better to commence with dilute solutions and complete the process in the strongest spirit.

For secretory glands in general, as the pancreas, salivary glands, etc., it is best to use absolute alcohol at once. The hardening is frequently complete in twenty-four hours, and although there is much shrinking of the tissue yet the sections will take staining very readily.

POTASSIC BICHROMATE SOLUTION.

Many prefer a 2 per cent. solution of this regent to Müller's fluid. It is used in the same way as recommended for that fluid.

AMMONIA BICHROMATE SOLUTION.

A two per cent. solution of this is preferred by some to the potash solution. It is similarly employed. It is especially mentioned as a valuable hardening agent for the nervous structures.

CHROMATE OF AMMONIUM.

A five per cent. solution is used. It is especially recommended for showing the rods of Heidenhain in the lining cells of the uniniferous tubules. It is only necessary that small portions of the cortical substance of a kidney be placed in the solution for forty-eight hours. It is a valuable reagent for showing the "goblet cells" of Klein. A piece of small intestine is placed in the solution for forty-eight hours, after which it is well washed in water and some of the mucous membrane removed and mounted in glycerine jelly.

CHROMIC ACID.

Chromic acid may be used in solution with water. A 1 per cent. solution is made and this is reduced to a $\frac{1}{4}$ or $\frac{1}{6}$ per cent. solution when required for use.

CHROMIC ACID AND ALCOHOL.

Make a $\frac{1}{6}$ per cent solution of chromic acid and to one part of this solution add two parts of alcohol. It should be made only when required for use. It is a generally useful solution and hardens tissue in from a week to ten days. As soon, however, as the tissue becomes tough, yet retaining its elasticity, it is washed in water and transferred to alcohol.

The fluid should be changed the second day.

PICRIC ACID.

Use a saturated solution in water. It will harden small pieces of tissue in 24 to 48 hours. It is especially useful for decalcifying fœtal bones and for the study of cartilage. The pieces of bone and cartilage are left in the solution until a needle is readily passed through the bony structure. Tissues hardened in this reagent are stained a yellow color, which can be largely removed by prolonged soaking in water. The sections are easily stained with picrocarmine.

OSMIC ACID.

A $\frac{1}{4}$ per cent. solution is generally employed although stronger mixtures are sometimes required. It is best to keep a 1 per cent. solution on hand, and dilute it as required. It is a very poisonous and expensive reagent and is very liable to spoil by exposure to light.

It is used to study the course of medullated nerve-fibres, as it blackens all fatty matters, and for many other tissues as recommended in the body of the work.

DECALCIFYING SOLUTIONS—FOR SOFTENING BONE.

Chromic acid	1 gram.
Nitric acid, strong	2 c. c.
Water	200 c. c.

When a fine needle can be passed through the bone, it is removed from the solution and thoroughly washed in water, after which it is hardened in alcohol. The nitric acid removes the lime-salts while the chromic acid hardens the parts. The fluid should be frequently changed or what appears to answer as well, a few drops of nitric acid may be added from time to time if the softening process is delayed too long.

HYDROCHLORIC ACID.

A 12 per cent. solution will remove the lime-salts from an injected bone.

PICRIC ACID.

A saturated watery solution is very useful for decalcifying fœtal bones. The mixture should be frequently changed or fresh crystals of the acid added.

DISSOCIATING FLUIDS.

Dissociating fluids are those which dissolve or soften certain parts of a tissue without affecting the other parts, so that by shaking or teasing, the unaffected portions can be isolated.

IODIZED–SERUM.

A few crystals of iodine are added to blood-serum or amniotic fluid until it is of a light brown color. It will dissolve the cement substance between cells in from one to two days. It is generally useful as a dissociating fluid.

CHROMIC ACID.

Very weak solutions are used, not stronger than .02 per cent. In two or three days it acts sufficiently to allow the separation of the fibrillæ of muscle and the nerve cells of the spinal cord.

OSMIC ACID.

From a .1 to a 1 per cent. solution is useful for general purposes.

MÜLLER'S FLUID.

This fluid is useful for the stomach and kidney.

SULPHURIC ACID.

This acid is useful for isolating the cells of cornified epithelium, nails, etc. The cells are placed in the acid for a short time when they are removed and thoroughly washed in water to which has been added a few drops of ammonia.

HYDROCHLORIC ACID.

A fifty per cent. solution is useful for isolating the uriniferous tubules of the kidney. The section of fresh kidney should be thin, and it should remain in the acid from ten to fourteen hours, when it is washed in alkaline water.

CAUSTIC POTASH.

A thirty per cent. solution is useful for the muscular and nervous tissues.

NORMAL FLUIDS.

In preparing specimens for examination, and while they are being examined, it is often desirable to have them

surrounded by a fluid as near as possible of the same nature as the fluid that surrounded them while in the body. Such fluids are called the "normal" fluids. They are:

1. *Normal Saline Solution* made by adding 7.5 grammes of sodic chloride to 1000 c. c. of distilled water. It is then a $\frac{3}{4}$ per cent. solution of common salt.

2. *Blood-Serum*, obtained by allowing some blood to clot in a flat vessel.

3. *The Aqueous Humor of the Eye.*

4. *Idodized-Serum*, a few crystals of iodine are added to fresh serum or amniotic fluid to preserve it.

"MRS. LOUISA REED STOWELL is about to engage in an important work for a Cincinnati publishing house. It is to be a microscopical description with drawings of all the medicinal plants of the United States. The book will be the text book for the Pharmacists."—*Courier.*

THE officers of the Denver Microscopical Society: President, Prof. H. F. Wegener; Secretary, H. B. Chamberlin; Treasurer, Dr. E. A. Rodgers; Chairman, Ex. Com. Prof. S. H. Short. This society was organized a little over a year ago. It is the only society between the Missouri and California. Its members are active and wide-awake.

"PROF. C. H. STOWELL, of the University, gave a sciopticon exhibition, last Friday evening, before the "Stowell Microscopical Club" of Albion College. The lecture was illustrated with some fifty microscopical preparations of animal and vegetable tissues, magnified over 700 diameters, and thrown upon the screen by the aid of the lime-light sciopticon with microscope attachment. College Hall was well filled. A reception was tendered Dr. and Mrs. Stowell and visiting friends from Jackson, with members of the club, at the residence of Prof. Delos Fall."

Editorial Department.

WE have been favored with visits from Mr. Carl Lomb, of Rochester, N. Y., and Mr. Griffith, of Fairport, N. Y.

Mr. Lomb spent the evening with us in testing some fine glasses and in trying new accessories.

Three objectives of Mr. Lomb's are especially good for their kind; the "students" one-fifth; the "first-class" one sixth, and the "homogeneous" one-eighth.

Mr. Lomb had with him a new sub-stage immersion illuminator, working on the principle of the parabola. As soon as the cut arrives to illustrate the article we will again call attention to this superior accessory.

During the evening we tried our one-fiftieth and easily resolved the amphipleura, using only the ordinary method of illumination with bulls-eye condenser and mirror.

Mr. Griffith reports activity all along the lines, and says there is a growing interest everywhere in microscopical matters. He showed us one of his new cone-fitting nose-pieces which appeared to work with satisfaction.

Both gentlemen bore testimony to the effect that the coming annual meeting in Rochester will be another grand success. Mr. Lomb says the best men in the city have charge of local matters and they are already at work; while Mr. Griffith says that all parties are working harmoniously together.

NOTHING has met our more decided approval, in a long time, than the recent change in the price of the *American Monthly*, at Washington. Mr. Phin's journal was too cheap. Mr. Hitchcock's journal has furnished altogether more matter than the subscription price called for. We are glad the price is now $1.50 a year and only regret that the publishers could not see their way clear to place it at $2.00, where it belongs. This journal would have followed the example at once; it stands ready to do so now. We have no ambition to conduct a journal with a low subscription price, and one dollar is altogether too

low. If a specialist is not willing to pay $2.00 a year for a specialists' journal then he has but a microscopical idea of his specialty.

WE will be very grateful if you will favor us with the addresses of those parties whom you know to be interested in microscopy, especially those who own instruments.

While we cannot recompense you for your labor, still we will be glad to show our appreciation of it by mailing to your address some human muscle, containing encysted trichinæ, enough for several mounts. Directions for mounting will accompany each bottle.

IT is expected to continue the "Studies in Histology" through the year. When complete they will form a text-book.

Mrs. Stowell appears in our May number with an original article on vegetable histology, illustrated with a full page cut.

IN answer to requests received during the past year from a large number of our friends, that we give them an illustration of our own faces, we would state that if we ever get over blushing from the effect of these compliments we may sometime startle them with the incomprehensible rebus of the senior editor; the junior editor must speak for herself.

A NEW monthly journal, to be known as the *American Meteorological Journal*, edited by Prof. M. W. Harrington, of the University, is soon to be published, the first issue being on the first of May. A journal, devoted to modern scientific meteorology and allied branches of study is much needed in this country to serve the interest of American students. It begins with from 24 to 32 octavo pages, the price being $3.00.

Prof. Harrington was the first person to interest the junior editor of this journal in microscopical matters. He was one of the first in this country, and the very first in this University, to

advocate the establishment of a microscopical laboratory for the especial study of structural botany or vegetable histology. His first class consisted of only six members, Mrs. Stowell forming one of the number. While the microscope the professor now uses does not have such a remarkable magnifying power, still the instrument is of immense size, having wonderful penetration; in fact, *it is the microscope of the astronomical observatory.*

MESSRS. J. U. AND C. G. LLOYD, of Cincinnati, are about to issue a new quarterly journal of 32 pages, entitled *American Drugs and Medicines.*

The work will be fully illustrated with original engravings from photographed specimens, together with plates exhibiting the microscopic structure of the medicinal plants of America. The editors will forward a prospectus to any one desiring it. It is expected that the first number will appear during the present month.

EDITORIAL EXCERPTS.

DR. GREGG VS. THE GERM THEORY.

DR. H. THOMAS, of London, England, has written considerable on the germ theory and in a late article he says, refering to Dr. Gregg, of Buffalo: "The tone of Dr. Gregg's paper implies that scientific or microscopic observers are a distinct race of beings, and are at variance with medical men generally. * * * As he claims in his paper to have 'given some attention to bacteria the last few years,' it is not asking too much of him to particularize which shall bear the distinctive name of *Bacterium Greggii!* * * * Can any one suppose coagulating granules of fibrine pass through such changes, develop tails, split and multiply, and the young coagulating granules' grandsons go through similar changes? *Credat Judæus!* * * * Dr. Gregg is asking too much for us to believe his coagulating fibrine to do any such marvelous work, and this on his mere assertion, *and without any proof.*"

MICRO-ORGANISMS AND THE DECAY OF TEETH.

Mr. W. Miller has made more than a thousand sections of decaying teeth and has not failed in a single instance to find a microscopical branching fungus, deep in the bony structure. Fuchsin, methyl-blue, and other stains show masses of bacteria in both longitudinal and transverse sections. Great masses of micrococci, bacilli, and leptothrix threads pass into the dentinal canals.

AN ELECTRIC MICROSCOPE.

This is simply an ordinary sciopticon with microscopic attachment, having the light furnished by a battery, instead of the more ordinary lime light.

An instrument of this kind has created considerable interest in Paris, on account of the public exhibitions given of popular objects. "The eye of the fly was presented in a form no less than four million times its natural size." This is really only two thousand diameters. It is not at all uncommon for us to employ a power of one thousand diameters with our lime-light sciopticon, and were our room large enough to get the proper distance, there is no reason why the power could not be at least doubled.

Items.

THE STUDY OF HISTOLOGY.—The study of histology ought to be insisted upon before permitting medical students to attempt the study of pathology; not by lectures alone, but by the use of the microscope in the laboratory.

ADULTERATED PEPPER.—A new adulterant of ground pepper is a finely-ground preparation of the kernels of olive berries. If a sample of the suspected mixture is scattered upon a mixture of equal volumes of glycerine and water, the pepper floats upon the surface, while the ground olive kernels sink.

BACILLUS TUBERCULOSIS.—The *British Medical Journal* sums up the present state of our knowledge respecting the bacillus tuberculosis, thus: "For the development of the parasite some disease or defect in the pulmonary tissue is necessary,

The bacillus tuberculosis cannot establish itself in healthy lung tissue."

A New Test for Organisms in Water.—Dr. Angus Smith's test consists in rendering the water thick by dissolving gelatine in it. If pure, the gelatine cylinder remained long unaltered; but if the water is impure from the presence of organisms, the gelatine round the organisms becomes liquified and globular, the organisms remaining solid at the bottom of the spheres.

Mounting Diatoms in Series.—P. Francotte has applied Giesbrecht's method of mounting sections in series to the mounting of diatoms. The slide is coated with the solution of shellac in alcohol, washed over with oil of cloves or creosote, and the diatoms, previously placed in absolute alcohol, arranged in order. The slide is then warmed, and the oil of cloves or creosote evaporated.

Bi-centenary of Bacteria.—Cohn calls attention to the fact that, in a letter dated 14th September, 1683, A. van Leeuwenhoek gave notice to the Royal Society that with the aid of his microscope he had discovered in the white substance adhering to his teeth very little animals, moving in a very lively fashion. "They were the first bacteria the human eye ever saw."—*Nature.*

Bacilli of Tubercle.—According to Prof. Rindfleisch, tubercular bacilli are best stained by fuchsin soluble in alcohol, but not in water. Two or three drops of a concentrated solution in 2–3 cm. of anilin-oil water are sufficient. The staining is especially good at 40° C. The bacilli are uniformly stained if a few drops of fuchsin are added to a mixture of equal parts of alcohol, water, and nitric acid.

The Eyes Connected.—It has been shown by Knies and Horner, by injections of Prussian blue in dead bodies, that there is a direct communication between the two retinæ by the way of the optic nerves and chiasma. Pfluger has corroborated these assertions by making injections in dogs with a few drops of a saturated solution of fluorescine. This fluid is forced into the optic nerve, so that it passes not only into the subarachnoid but also into the subdural space. Two minutes after the injection both eyes showed a fluorescence of the retina,

which persisted for five weeks. A small quantity injected into the orbital cellular tissue gave no result.

CICERO TALKING ABOUT DENTISTRY.—*Editor Christian Advocate:* Below find a quotation from Cicero "on the laws," page 450, bearing on teeth, in which you may be interested. The "Twelve Tables," from which it seems to be taken, were enacted about B. C. 450: "And since in the law there was this clause, that gold should not be buried with the dead, how human is the exception made by another law, *that if the teeth of the deceased* were *fastened with gold*, the corpse might be buried or burned without taking it away, and no wrong be done."

TRICHINOSIS.—At the last quarterly meeting of the Illinois State Board of Health, three outbreaks of trichinosis—one of them resulting in three deaths—were reported, the first during the early part of November, in a family near Gardner, Grundy county; the second and third during December, in Woodburn, Macoupin county, and in Bloomington, respectively. The Gardner and Bloomington cases resulted from eating uncooked pork and sausage, and the Woodburn cases from raw smoked sausage. Specimens of the meat from Gardner and Woodburn were sent to the secretary for examination, the character of the disease being only suspected, until the microscope showed, in one case, about 2,000, and in the other, about 8,000 trichinæ to the cubic inch.

CILIA IN THE HUMAN KIDNEY.—That a large portion of the renal tubules in cold-blooded vertebrates is ciliated has been known for some time. It has also keen known, from the observations of Bowman and others, that the neck of the Malpighian capsule in mammals is ciliated. A. H. Tuttle found, from the examination of a large number of sections of human kidneys, that the convoluted tubule is very extensively, if not generally, ciliated. Where the flat lining-cells of the capsule approach the neck, they become cuboidal and ciliated also. The cilia in the kidney are from 3.5 to 5 μ long, very fine, numerous, and closely set. Confirmatory observations were made on the kidney of a kitten. The cilia are probably present in all mammalia, and serve to propel the urine outwards or towards the ureter.—*C. S. M., in Science.*

Reviews.

METHODS OF STUDYING THE BRAIN.

The Cartwright Lectures. Delivered before the Alumni Association of the College of Physicians and Surgeons, New York City, February 2, 4, and 6, 1884. By Prof. B. G. Wilder, M. D., of Cornell University. Lecture I.

THE NORTH AMERICAN REPTILES AND BATRACHIANS. By Samuel Garman.

REPORT OF THE SURGEON-GENERAL OF THE NAVY. Government Printing Office, 1882.

This is of interest to our readers largely because of a report on the "Microscopic Examination of Air." It is illustrated with a number of phototypes, showing the various forms that are found in the dust of the air—epithelium, starch, threads, hairs, pollen, bacteria, crystals, etc., etc.

SCHOOL HYGIENE. By Chas. T. Lundy, A. M., M. D., Professor of Diseases of the Eye and Ear, in the Michigan College of Medicine, Detroit. Read before the American Health Association, 1883.

Dr. Lundy not only points out the dangers and evils of our present system of school hygiene, but also tells us how to remedy these defects. It is a paper that should be in the hands of every school board and public school teacher in the land.

THE CENTURY. Century Co., Union Square, New York.

The March number of this excellent journal has a fine engraving of Von Moltke for the frontispiece, followed by a sketch of his career. Among the attractions of the number is an article on "The Next Presidency," "Henry Irving," and another chapter of the interesting story of "Dr. Sevier." There is a sharp letter also from "The Author of 'Bread-Winners'."

CATALOGUING, LABLELING AND STORING MICROSCOPICAL PREPARATIONS. By Prof. S. H. Gage, B. S., Ithaca, N. Y. Reprint from Proceedings of Chicago meeting of American Microscopists.

PROTECTIVE INOCULATION. By Noah Crissy, M. D., Ph. D., Hartford, Conn. Reprint from the Proceedings of the State Board of Health for 1882.

THE ART INTERCHANGE.

For the first time this comes to our table. It is devoted to decorative, household and pictorial art, literary and art news. It is handsomely illustrated with the leading examples of art. It is a bi-weekly, and costs three dollars a year. It is edited by a lady, and the junior editor of this journal would like to exchange.

ANIMAL AUTOMATISM AND OTHER ESSAYS. By Prof. T. H. Huxley. No. 53 of the "Library of Popular Science." Price, post free, 15 cents. J. Fitzgerald, Publisher, 20 Lafayette Place, New York. For sale by Willis Boughton, Ann Arbor, Mich.

In this volume are contained five of the most instructive and interesting of Professor Huxley's later essays, among which are "The Border Territory between Animals and the Vegetable Kingdom," and "Universities, Actual and Ideal."

A PRACTICAL TREATISE ON THE MANUFACTURE OF STARCH, GLUCOSE, STARCH-SUGAR, AND DEXTRINE. By Julius Frankel, Graduate of the Polytechnic School of Hanover. Edited by Robert Hutter, Proprietor of the Philadelphia Starch-Sugar Works. Illustrated by 58 engravings. Large 8vo, pp. 344. Price, $3.50. Henry Carey Baird & Co., 810 Walnut St., Philadelphia, Pa.

It is a fact that this class of industries has always been surrounded by great mysteries. No one could find out the methods employed, and but few could gain access even to the inside of the factories. Manufacturers of the necessary machinery have refused to show the drawings of the machines. So in the face of all this appears this complete treatise, "the only book on the subject ever published in the English language." The work treats of the formation, substance and nature of starch, its physical and chemical properties, and its manufacture; also the manufacture of starch-sugar, dextrine, etc. Those who are interested in this branch of study will welcome a work of this kind, for which there has been a demand for years. It is exhaustive and complete.

AT THE DOCTORS EXPENSE.

In an examination in one of the New England Colleges a student defined fish as "kinder flat, and pointed at both ends." Cell division was described as follows: "one old cell makes one new cell, one old cell makes two new cells, two old cells make lots of new cells." At another college a student gave the dog as an example of the Insectivora and on being asked why replied "because he eats flies."

The Wonders of Optics.—*Sir:*—Mr. James W. Queen, I have the honor to address you a few lines in regards of one thing that you may have in your line of things. I myself want to get from you if you have it, I hope you do; I want to know if you have a glass that I can see through paper or leather, and if you have one, please to be kind enough to send me the price of it at once. I am, very respectfully, your ob't. servant. *

(Punch a hole in the paper or leather.—Ed.)—*Bulletin.*

Anecdotes of Sir Astley Cooper.—Sir Astley Cooper is said to have been in such haste to reach his out-of-town appointments that he urged the drivers of the post chase thus: "I give three pence a mile to a boy who drives slow, four pence to one who drives fast, and six pence to one who drives like the d——." He lived in grand style and was very fond of money. It is stated that in his last years while at a country seat he turned an honest penny by buying up disabled horses and by surgical knowledge restoring them to health and usefulness and disposing of them at a large profit.

During the performance of a thrilling play in Norwalk, Conn., lately, a well-known physician of the town, who seldom entered a theatre, was among the audience. When the part came where the heroine swallowed the poison, is dying, and her lover and friends are wringing their hands and crying helplessly, "What can be done?" the doctor was seen to be laboring under considerable excitement. At last the terrible scene was too much for him, and, forgetting where he was, he jumped to his feet and shouted: "Give her coffee, you fools; give her coffee!" Then a friendly hand pulled him back into his seat, and the surprised actors went on with the play.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

I HAVE quite a collection of histological mounts which I should like to exchange for other good slides. E. M. WATERBURY, M. D., Saratoga Springs, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

FOR SALE.—Sections of human teeth with pulp in situ, $1.00. F. A. JACOBS, Newark, O.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

A LARGE number of histological specimens, handsomely mounted, for exchange for any kind of mounts for the microscope. G. A. SPRECHER, M. D., Oakland, Cal.

FOR SALE.—Zentmeyer's histological stand, rack and pinion, coarse adjustment. Glass sliding stage with spring and screw. A eye-piece, $\frac{8}{10}$ and $\frac{1}{5}$ in. objectives. Stage and eye-piece, micrometer, neutral tint camera from Bausch and Lomb. Cost $70. Will sell for $55. New and unused. MAURICE A. MINER, Lake Geneva, Wis.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc. W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Spermatozoa of Horse, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, 504 Upper Second street, Evansville, Indiana.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, MAY, 1884. No. 5.
WHOLE NO. 22.

Original Communications.

CLEMATIS VIRGINIANA.

LOUISA REED STOWELL.

THE name Virgin's Bower, applied to this species, is equally applicable to all the species of the genus. It is also called Ladies' Bower, Traveler's Ivy, and Love Vine, from reference to natural arbors which it forms.

The genus Clamatis is an extensive family, dispersed throughout the temperate regions of both hemispheres. It consists mostly of climbing shrubs, rarely erect, and more rarely with herbaceous stems. The flowers are very numerous and showy; hence different species are in cultivation as ornamental climbers. The properties of all the species, when fresh, are more or less acrid.

Plants of this genus can be readily distinguished from all other native climbing vines, by the peculiar habit they have of twining their leafstalks for support.

MICROSCOPIC STRUCTURE OF THE STEM.

Bark.—Beginning with the outside of the stem it is noticed that no epidermis is present. The *cork*, or outer layer of the bark, is composed of from five to twelve rows of thin-walled tabular cells of a brownish yellow color. The *green*, or *middle layer of the bark*, is of nearly the same width, and is composed of from five to twelve rows of oval parenchyma. Next to the green layer come large crescent-shaped masses of liber fibre. A cross and longitudinal view of a single liber fibre is seen in fig. B, c 1, c 2.

Just inside of this liber fibre is found a secondary formation of cork and the green layer of the bark, smaller and more delicate than the first. Embedded in this second green layer are masses of large stone-cells. These have rather thinner walls than the majority of stone-cells, still the walls are much thicker than all the other cells of the stem excepting the liber fibre. (See h, figs. A and B.) Then come other slender, sharply pointed, crescent or horse-shoe shaped masses of liber fibre. The spaces inside of these inner masses of liber are filled up with hexagonal, thin-walled parenchyma. These masses of liber and the enclosed parenchyma form the *inner layer of the bark.*

The *cambium* separating the bark from the wood is composed of from three to six rows of tabular cells, clear white, and filled with protoplasm.

Wood.—The *medullary rays* are made up of from three to ten rows of thin-walled, white tabular cells. Between these medullary rays are the small, thick-walled, clear white cells of wood *prosenchyma*, resembling somewhat the liber fibre. With these are numerous large, open, pitted cells. The ends of these cells are seen in fig. A, m; while in fig. B, m, the length of the cell is seen with the numerous pitted marks on its surface.

Two or three annular rings are generally to be seen in this stem.

Between the wood and the pith is the *medullary sheath*, composed of fine spiral vessels.

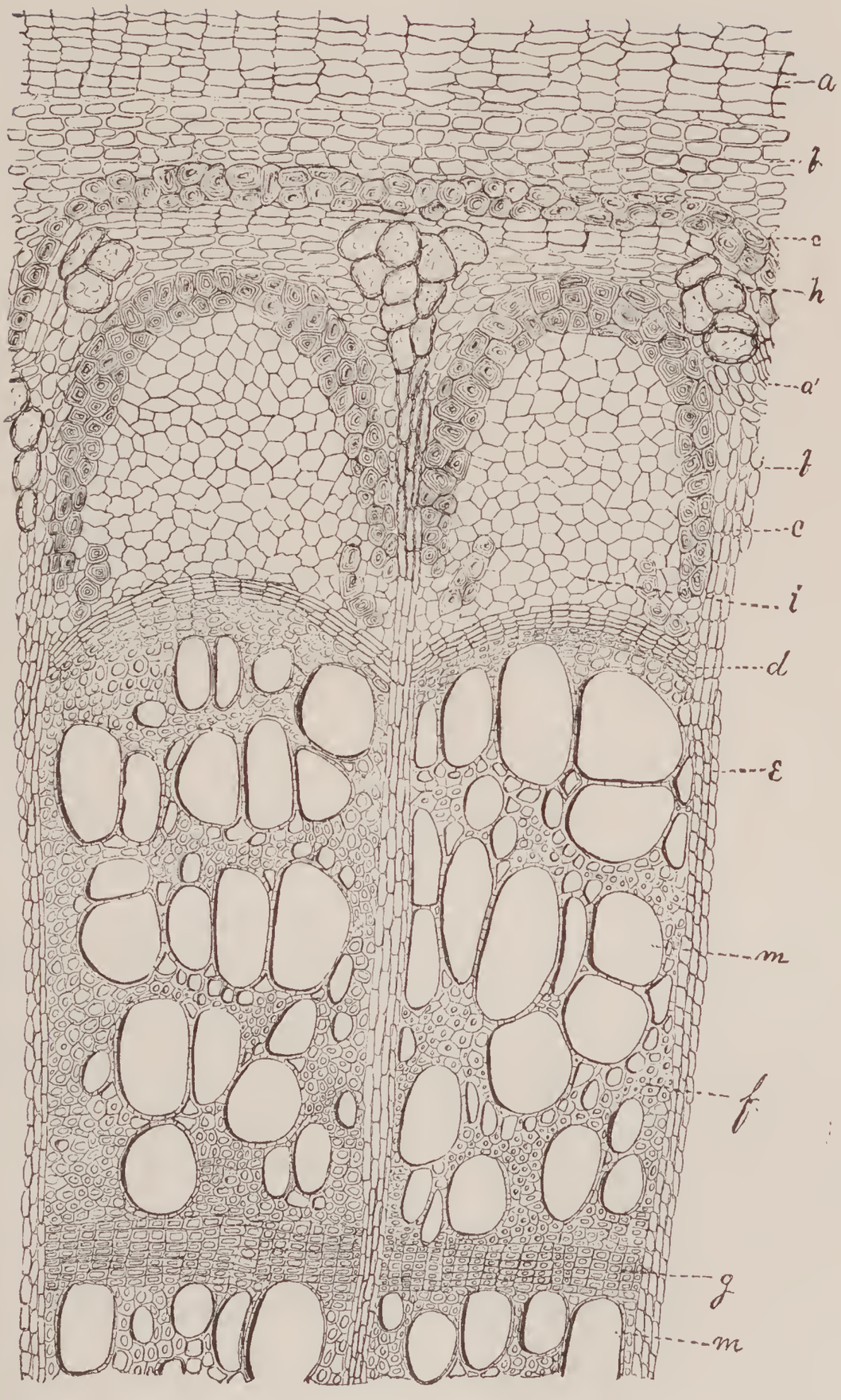


FIG. A.

Pith.—Thin-walled, brownish, hexagonal cells of parenchyma make up the pith. Occasionally, pitted marks are found on the surface of the cells.

DESCRIPTION OF FIGURES.—Fig. A.—a and a′, cork; b and b′, the green layer of the bark; c, liber fibre; h, stone-cells; d, cambium; e, medullary rays; m, pitted cells; f. wood prosenchyma; i, parenchyma, or liber layer of the bark. Drawn with a 4-10 inch objective, and an "A" eye-piece.

Fig. B.—h, stone-cells; c, 1, cross-section of liber fibre, c, 2, longitudinal view of the same; m, pitted cell of the wood, longitudinal section. Drawn with a camera lucida, with an ¼ inch objective, and an "A" eye-piece. [Fig. A and B reduced one-third.]

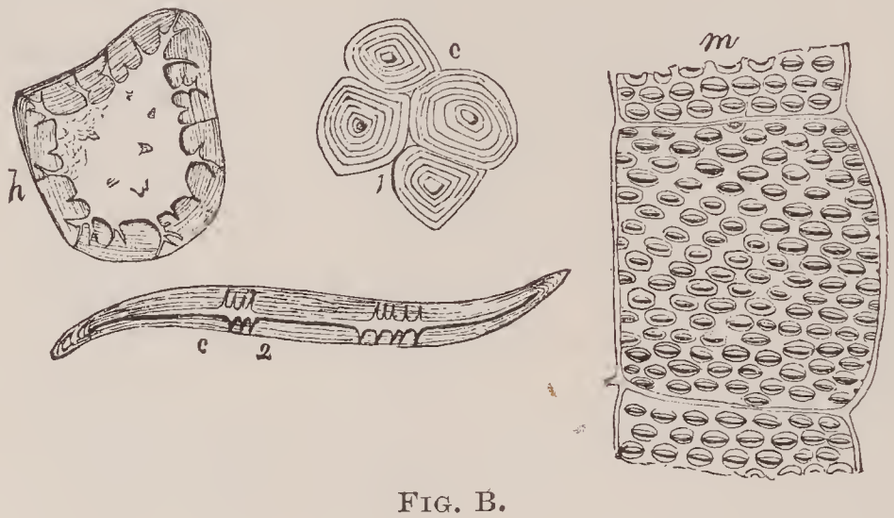


FIG. B.

ASTASIA VERSUS ENGLENA.

J. M. ADAMS.

KENT, Stein and others have made quite a change in the classification of Astasia and Englena, retaining the old features of the pigmentary eye spot and caudal extremity of Englena, but adding greater distinctions in the oral aperture and endoplasm. The Astasia has a large widely dilatable clearly defined oral aperture leading into a distinct tubular pharynx or œsophagus, capable of taking in quite large particles of food or colored granules which may temporarily give coloring to the internal portion as appears to the naked eye, but not really, coloring the otherwise always colorless and homogeneous endoplasm.

The Englena has no distinct oral aperture, or at best an extremely small and almost invisible oral aperture, not dilatable nor continuous and able to take in only the minutest food particles, while the endoplasm is capable of assimilating chloro-

phyll, coloring the endoplasm evenly all through a bright green usually, but sometimes a red.

The so-called Astasia haematoides may therefore prove to be upon closer observation a variation of the Englena viridis. Stein has given copious illustrations of this cosmopolitan species but still open to further investigations.

THE McCALLA NOSE-PIECE.

ALBERT MC CALLA.

MR. BULLOCH'S letter, in your March issue, opens with the remarkable statement that "he has always given me credit for suggesting the idea" of the "Congress Nose-Piece." What various amounts of credit he may have given me in private I do not know, but it will be remembered that the occasion of my writing the protest which appeared in your February issue was Mr. Bulloch's announcement in the December number of your journal of this nose-piece as a new invention of his own. There was not a word to hint that I or any one else had had any share in its device. The notices in the Journal of the Royal Microscopical Society, in the American Microscopical Journal, etc., are alike destitute of any word or phrase to intimate that I had even offered a suggestion on the subject. So much for the truth of the opening statement; and those that follow are of the same character. "Falsus in uno, falsus in omnibus."

Mr. Bulloch next attacks the report of my address in the Proceedings of the A. S. M. The reference is an unfortunate one for him. The Proceedings are correct, and simply serve to establish the truth of my claim. The phrase he objects to—"and Mr. Bulloch promises to have some specimens of this form ready to show at our next meeting"—was *not* in the *Chicago Times* report of my address. What I *said* on that evening was, "I hope to have some specimens of this form ready to show at our next meeting," and as this was not written in my original MS. it did not appear in the *Times*' report. I had fully intended having a specimen made up to exhibit at *that* meeting, but in the pressure of my correspondence and other preparations for the Chicago meeting, I neglected to care for my own

interests as I should, and put this off till too late. During the session I commissioned Mr. Bulloch to make it, and he agreed to do so (*not* "to work it out"), and hence when I put the MS. into the hands of Secretary Kellicott I inserted the phrase in the form in which it appears. Now, although the Proceedings did not finally appear till about the holidays—long after I had learned of Mr. Bulloch's breach of faith, the first sheets containing my address were set up, revised, and printed off by the 27th of August, as is shown by a letter of Secretary Kellicott, of that date; and the sentence in question is thus an indisputable evidence of the fact that I had engaged Mr. Bulloch to construct some specimens of a device of my own designing, and which I expected to exhibit as my own at a future meeting.

But I cannot tax your space nor the patience of your readers so far as to follow up all the statements and insinuations of Mr. Bulloch's letter. Nor is it worth while. I have no desire for such controversy. I shall simply say that I *did* show drawings of my device to Mr. B. in 1880, and again in 1883; that my plan was not a mere suggestion for him to work out, but a complete device, needing only mechanical skill and facilities for its construction. He has made up that device, patented it as his own, and published it to the world as his own, and now boasts of his "enterprise" and shrewdness. I shall not disturb his enterprises any further.

TINTINNIDIUM SEMICILIATUM (STERKI) S. K., AND PHALANSTERIUM CONSOCIATUM (FRES.) CIENK.

DR. ALFRED C. STOKES.

HAVING recently collected these Infusoria in some profusion, I am able to confirm some of the discoverer's statements concerning the first-named organism, and to add somewhat to our knowledge of its structure. It has not been recorded from England, nor seen until now, so far as I can ascertain, by any but its discoverer, yet some of the latter's assertions have been doubted. Sterki describes the individual members of the adoral ciliary wreath as large, broad appendages with their distal extremities pectinated, and so convinced is he of the correct-

ness of his interpretation that he figures one of these organs. It has been said, however, that this fimbriated aspect is probably an optical illusion due to the rapid vibrations of two concentric ciliary circles. Sterki's observations are somewhat incomplete if the species I have is identical, as I suppose, with his *Tintinnidium conciliatum*, yet he is not the victim of an illusion; there is but a single row of these adoral cilia, and they are distinctly fimbriated distally, not, indeed, as his figures seem to indicate, with rigid teeth, but with fine, flexible filaments of great delicacy. In several instances I have observed cilia with one or more filaments thrown into a loop, as in Figure 1.

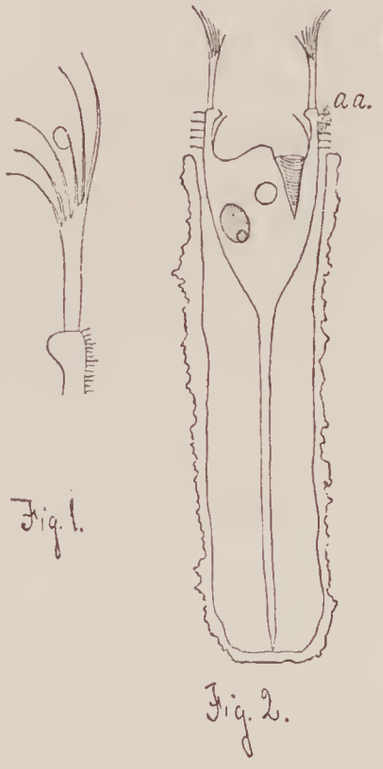


Fig. 1.

Fig. 2.

With my specimens the peristome border encloses the inner series of short, simple cilia, as well as the vibrating tongue-like projection, mentioned by Sterki, and the outer wall of the oval cleft is itself ciliated, a structural feature not before noticed. The peristome border bears externally numerous setæ arranged in perpendicular, equidistant rows of four or five bristles each, and a single, obliquely-directed anterior series of twelve or fifteen. These become conspicuous as the animalcule, when extended and undergoing reproductive fission, continually and slowly rotates, thus bringing each series successively into focus. How this movement is accomplished without perceptible twist-

ing of the pedicle is a mystery. It is possible that when the creature darts backward into its sheath a rotation in the opposite direction may straighten out its affairs; but of this I have witnessed nothing, as its retractile movement is very rapid.

The ciliation of the cuticular surface is, as the specific name indicates, and as stated by the discoverer, confined to the anterior region.

Nothing has been published, or, I presume, observed, in reference to the position of the anal orifice. In my specimens it opens anteriorly, outside of the peristome border and at one side of the pharyngeal cleft (*aa*, in Figure 2). The contractile vesicle is somewhat larger and more anteriorly placed, and the nucleus rounder and more granular than represented by the discoverer's figures, but with these unimportant exceptions and the partial ciliation of the pharyngeal passage, which may easily be overlooked, and is, indeed, visible only when that cleft is widely expanded, the forms in my gathering do not essentially differ from *Tintinnidium semiciliatum*. The mucilaginous loriea is .0050 inch long, the animal, exclusive of adoral wreath and pedicle, .0028 inch. Figure 2 represents an optical somewhat diagrammatic section of the Infusorian as observed by the writer.

Reproduction is by transverse fission, the first noticeable feature of the process being the appearance of the adoral cilia on one side of the equatorial region of the mature zooid. The newly formed cilia do not seem to become fimbriated before the escape of the separating moiety. The nucleus elongates, assumes a dumb-bell form, and divides transversely with the body. The newly separated zooid is entirely ciliated and without pedicle.

In *Science*, October 13, 1883, I noted the discovery for the first time in this country, of the uncommon *Phalansterium digitatum* (Stein). I have recently taken the only other species of the genus, *Ph. consociatum* (Cienk.), in the same little pool with the *Tintinnidium*. It is interesting that both these species should be on this side of the sea and not in England, where they have been searched for; and the fact seems of sufficient importance to be recorded here.

TRENTON, NEW JERSEY.

AN EDITOR'S LIFE.

C. H. STOWELL.

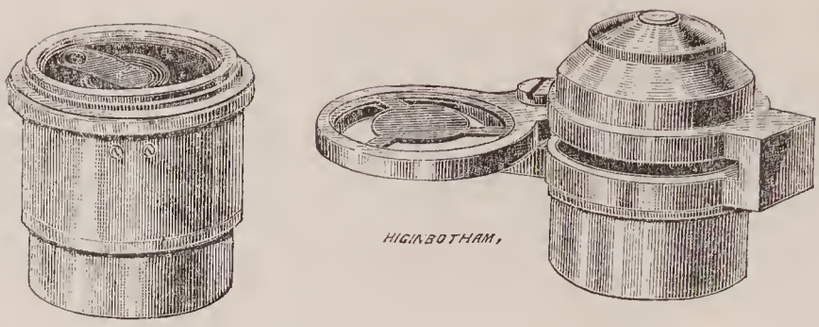
EDITORIAL work is made easier and pleasanter when the mail brings such a beautiful letter as the one given here. Although the letter was never intended for publication, yet as we withhold the writer's name he will forgive us:

"I am an old man, and find the working of the microscope very pleasant employment for the evening of life. I have gone through the whirl of a busy life, and got far into the afternoon of a long active day and now enjoy the quietude of rest, and in order to make rest pleasant I bought a microscope and have for several years made it my companion, but it was a long time before we understood each other, for I knew little or nothing about microscopes, and not understanding my friend, I often found myself awkward in her presence, but the oftener we met the better acquainted and friendly we got, and now our friendship is very agreeable. One reason why we were so long in getting acquainted with each other was I had never handled a microscope, nor even have I yet had the pleasure of having the personal acquaintance of any one who has got a microscope. There has one lately arrived at the Wesleyan Female College, and that is the only one I have seen beside my own. Microscopes in the State of Georgia are few and far between, so what I do in that line I do all alone, and many pleasant hours I do enjoy and have enjoyed, and none but they who have enjoyed it can tell how refreshing and uplifting to the spirit is an hour with the microscope, an hour of thoughtful, reverent study of the wisdom manifest in the construction of the minutest animalculem, the bending of a claw, or the articulation of a joint."

A NEW CONDENSER.

ED. BAUSCH.

THE new condenser, figured with this, is in its appearance and performance similar to that devised by Prof. Abbe. The formula upon which it is constructed is however a modification of that used in our Immersion Illuminator. The posterior system is as large as the substage-ring will allow, and will transmit and condense all the rays which pass through this from the mirror. Its numerical aperture is about 1.42—suffi-



cient for all modern objectives of the largest angular aperture. The light is concentrated to practically one point, where it is sufficiently strong to give good illumination with the highest amplification, but its intensity may be decreased by proper stops or the light may be distributed over quite a space by varying the distance from the slide. It may be used both dry and with the various immersion fluids.

We furnish it with two styles of mountings, with which the same results may be gained as with almost all the various substage illuminating apparatus.

No. 2 consists of the substage adapter and condenser with a swinging diaphragm ring between them. This ring receives the various stops, and these latter may be changed without disturbing the condenser—diaphragms with various sizes of central stops are furnished, which give dark ground illumination, others which cut off peripheral rays, to decrease the amount of light, and still others with circular openings placed at different distances from the center, to give different degrees of obliquity. A stop is provided for the diaphragm ring when it is in central position.

No. 1 is intended to give the different degrees of oblique illumination, from central to that of the utmost possible limit. It is provided with a circular opening, $\frac{1}{4}$ inch in diameter, which may be decreased if desired, and which is caused to move slowly from center to the edge of the mounting by turning the outside milled edge.

Both of these mountings are adapted to substages attached either to the substage bar or fixed to the bottom of the stage. The condenser is also furnished with plain substage adapter only.

Selections.

EYE-PIECES AND OBJECTIVES.

BY ED. BAUSCH, ROCHESTER, N. Y.

[Read before the Section of Microscopy, Rochester Academy of Science.]

THE eye-piece and objective in the microscope are called the optical parts, but are essentially the only parts which make it up. The mechanical portions which are applied to the instrument are merely the conveniences for manipulating the object, and adjusting for focal distance.

The eye-piece is that portion of it which magnifies the image formed by the objective, and although its perfection depends upon its construction and accuracy, the distinctness of the image depends upon the perfection of the objective. All the various kinds of eye-pieces may be divided into two classes, the positive and the negative, in the former of which the focal point is outside of the lenses, and in front of the field lens, while in the latter it is internal, i. e., between the lenses.

In both the image is inverted, and its apparent size depends upon the combined foci of the eye-lens and field-lens. Among the positive are comprised the Ramsden, the Kellner Orthoscopic, the Periscopic, and others. The first is simply an ordinary magnifier, composed of two plano-convex lenses, and is used principally for micrometer work. The other two have correcting eye-lenses, and partially correct the errors in spherical aberration of the objective, thereby giving flatter and larger field.

In our correspondence we often find that there exists a misconception of the word positive, arising, I suppose, from the fact that the eye-piece which inverts the image is called the negative. Many suppose that it should show the image in a position corresponding to that of the object. Another eye-piece, however, is used for this purpose, which is composed of four lenses or systems, and is called the Erecting eye-piece. It is seldom used with the microscope, but it is of great value in the telescope, where it is called a terrestrial eye-piece. It is also positive.

The most common form used with the microscope is the negative, or Huyghenian; another is called the Solid, from the fact that it is made of one piece of glass. It was invented by Mr. Tolles. In this, when the diaphragm is put in, which is not always the case, it is formed by cutting a circular groove into it, same as in the Coddington lens. These eye-pieces are made only in high powers, and although there is a greater loss of light by the passage of it through the entire length of the glass, than in the Huyghenian, there is less by refraction, as this occurs in only two surfaces, while in the other it is in four, and it consequently gives a better illuminated field with the same objective.

The method of denominating eye-pieces of different powers has been by letters, A, representing the lowest power. This method has always been open to criticism, as it insures no uniformity,—and none has been sought after, one eye-piece of one maker representing a totally different power from one of the same rating of another maker. A more rational system is coming into use, and was first introduced in this country. By it the eye-pieces are rated according to the equivalent focus of the eye-lens. Thus an eye-piece in which the equivalent focus is 1 inch, is called a 1 inch; the $\frac{1}{2}$ inch in the same manner, and so on. This method gives approximately the magnifying power, as we know that a 1 inch lens magnifies ten times. It is supposed by many that the size of the tube influences the size of lenses and field, but beyond a certain limit this has no effect. The field is never enlarged beyond the requirements of the formula.

It is a pity that when the Royal Microscopical Society adopted the standard screw for objectives, it did not endeavor to arrive at more uniformity in the size of tubes. Our American Society of Microscopists is making a laudable effort in this direction, as also in the nomenclature of eye-pieces. Its committee has for the past two years been working up the subject, and it will probably be decided upon at the meeting to be held in this city. There are two difficulties which arise, one of which is the fact that one standard will not be sufficient, as it is manifest that a large tube which will be required in a large instrument will be out of place in a small one, and vice versa.

Another drawback lies in the question whether manufacturers will universally adopt the standards, as it will entail a loss in proportion to the amount of business, which will in no case be small.

In passing to objectives I will state what is probably known to all, that their nomenclature of rating refers to their magnifying power, and has no reference to working distance. They are rated according to a lens, the magnifying power of which is equal to that formed by the lenses comprising the objectives.

Objectives are made up of systems—systems meaning a single lens, or a set of lenses, which being cemented together, act like a single lens. Angular aperture is the angle formed by the extreme rays, which, coming from one point, are transmitted by the objective. Besides achromatism, it is the angular aperture of an objective which determines its quality. This it is which gives defining or resolving power to an objective,—which shows structure and detail. Angular aperture and working distance do not stand in a direct relation to each other, as is sometimes supposed. They vary according to the construction of the objective. In two objectives of the same angular aperture the working distance is not necessarily alike: even with two objectives of the same power and different angle, the one with the larger angle may have the greater working distance.

This brings me to speak of a curious fact which, although I was aware of it, did not draw my particular notice until a recent occurrence. We had an objective, which, to all appearance, was in every respect perfect. It was made up of seven lenses, gave a clear cut, colorless image, and had good resolution. I was, however, not satisfied with it in this latter respect, and decided to made a new one. The formula involved only five lenses. After the objective had been completed, comparisons were made, and with the following result: The angular aperture was to a degree the same in both. Working distance did not vary 1-100th of an inch. Both were equally well corrected, and had the same magnifying power; and still the new one, with only five lenses, resolved 60,000 lines to the inch, where the old one with seven lenses showed only 40,000.

The quality of an objective depends upon its chromatic and spherical corrections, flatness of field, and angular aper-

ture; and assuming objectives perfect in the first three qualities, we will only consider the latter. We say that objective is optically most perfect which has the greatest angular aperture. Why? Because it will show the greatest number of lines to the inch, by which I do not mean only ruled lines, or the much abused lines on diatoms, but structure and detail in the ordinary objects. It is absolutely necessary to use an objective of a given angular aperture in order to see a given number of lines, whether it be of one power or another. For instance, if you wish to see a line of 1-50,000 inch in width, it is necessary to use an objective with an angle of 65°, whether it be a $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, or $\frac{1}{8}$. An objective of smaller angle will not show them, no matter how perfect it may be. If the eye-piece be of too low a power, the lines may not be distinguishable with the $\frac{1}{2}$ or $\frac{1}{4}$, but by using the proper eye-piece they will become so. This is not due to any particular quality of the eye-piece, except in so far that it gives sufficient amplification to separate the lines that the eye may perceive them. It may be the $\frac{1}{8}$ objective with a 2-inch eye-piece, or the $\frac{1}{4}$ objective with a 1-inch eye-piece. This choice depends entirely upon the will of the worker, but has its limits. It is restricted on one side by angular aperture, on the other by the power of the objective which is used. There is a limit to the increase of amplification by eye-pieces, and when we cease to get a distinct image by adding higher power eye-pieces, we say it breaks down, i. e., there are not sufficient rays from the objective to bear the loss which each higher power of eye-pieces inflicts. By taking the same power objectives, but larger angle, we find that this can be done, this is due to the fact that a much greater quantity of rays are transmitted, and those which come to the eye are in excess of those which were lost by passing through the eye-piece. The other difficulty is that as the objectives increase in power, the difficulty of making the lenses and mounting them increases in the same proportion, and faults occur, which at the present day, it is impossible to avoid, and which detract considerable from the useful qualities.

Another factor enters here, which is, that the present ordinary methods of illumination under extremely high powers are insufficient to bring out details. I am happy to say that the

demand for these high powers is gradually decreasing. By high powers I mean all those over a 1-16. Although there is perhaps much to be desired in the improvement of objectives, we may still consider our present state quite an advanced one. Although the present theoretical limit of visibility is fixed at 146,528 lines to the inch, we need not be deterred from *attempting* to pass this point. The limit which was accepted some years ago as the true one, although considerably lower, was quietly ignored as the angular aperture in objectives increased. It is only a few years ago that the majority of microscopists refused to believe that *A. Pellucida*, which has about 100,000 lines to the inch, could be resolved, and now it is the work of beginners to do so.

But supposing 146,528 lines to be the limit, it is evident that a $\frac{1}{8}$ or $\frac{1}{10}$ objective with a $\frac{1}{2}$-inch eye-piece, is of amply sufficient magnifying power to make the lines visible to the eye, and there is therefore no need of using more. It is a good rule to follow, under all circumstances, not to use a greater power than is necessary to comfortably do the required work. Many people are unmindful of the fact that the amount of light which enters a room through a window is considerable more than that which comes through a key hole. The loss of light increases with each additional power, and it is perfectly natural when we consider that the openings in which the lenses are mounted decrease in the same ratio.

Maynifying powers may be varied by means of the draw tube, but is seldom used, as it destroys the standard to which the objectives were adjusted. In speaking of a standard, I am forced to ask, Have we one? It is safe to say that none exists; and it is strange that after these many years which have been devoted to the improvement of the microscope, and where such marked improvements have been made, so little attention should have been paid to this important matter, and such a limited knowledge of the subject should exist.

It is said that 10 inches make the standard, but what constitutes the 10 inches? No book states whether it should be the length of the tube, or whether the distance is from the front of the objective to the eye-piece, or from the back of it to the eye-piece. The matter is receiving the attention of mathematic-

ians, and it is now agreed upon that the 10 inches should be upon the focal plane of the objective to the focal plane of the eye-piece. While the focal plane in the eye-piece is about at the diaphragm, that of the objective is back of the posterior system of the objective, and varies with every power. In the lower powers it may be as much as an inch, while in the higher ones it is reduced to almost nothing. This shows that every change of power, either in eye-piece or objective, deviates from the standard, and that it is next to impossible to fix one which, under all conditions, may be maintained.

Again, it has been assumed that, as the standard length was 10 inches, a 1-inch objective and 1-inch eye-piece, each magnifying ten diameters, would give 100 diameters. But the actual measurements did not give this result, and from what I have stated it can be easily seen why.

ODE TO THE BACILLUS.

WM. TOD HELMUTH, M. D.

Oh, powerful bacillus,
With wonder how you fill us,
    Every day!
While medical detectives,
With powerful objectives,
    Watch your play.

In epidemic glanders,
In certain forms of "janders,"
    You delight.
E'en to the fifteenth culture,
Voracious as a vulture,
    You can bite.

Koch and Spina, growing splenic,
O'er your power septicæmic,
    Rant and roar.
Schmidt says when pus grows rotten,
Only then you are begotten,
    Not before.

In lung tuberculosis,
In skin necrobiosis,
How you squirm!
While gonorrhœal burning
Is caused by sporules turning,
Some affirm.

'Tis said a crypto-cocus
Will very often choke us,
If we fail
To drop the acid phenic—
Which is antisepticæmic—
On its tail.

Frier says in fever yellow
He finds a little fellow
Breeding pest.
Gregg swears, do what he will, he
Sees nothing but fibrilli,
By his test.

In atmosphere mephitic,
In poison diphtheritic,
How you revel!
In earth and air and ocean
You keep disease in motion,
Like a devil.

But, bacillus, oh! bacillus,
You try in vain to kill us,
Yet we thrive.
And though you try to blind us,
Next year I hope you'll find us
Quite alive. —*Hahn. Monthly.*

Mr. C. Fasoldt has just completed a number of the Standard Centimeters, by the request of R. H. Ward, of Troy, N. Y.

In all our dealing with Messrs. Tammen & Co., of Denver, Colorado, we have invariably received more for our money than we had any reason to expect. Notice their offer of Kaolinite crystals; and especially their offer of 20 cabinet specimens for a dollar. Their catalogue is a marvel of curiosities, illustrated and described.

THE PRESENT POSITION OF THE GERM THEORY.

THE rapid strides which pathological histology is making are gradually overtaking the elusive "cause of disease." Hunted down to the lowest forms of animal and vegetable organisms, it may now be said to have been driven out of them and into a smaller field, in which we are close upon its tracks.

Not that the relations of germs, bacteria and bacilli, are no longer of importance; they are of great importance, but they are no longer directly causal, only accessory to the true causes, as these are now understood.

To explain this it may be stated that the study of the life-histories of the lowest germs has shown that while they are present in disease, they are also in health; that they may be cultivated and inoculated without producing disease, although generally they may produce this result; and that noxious and innoxious varieties present no objective differences, and are therefore probably identical, and act differently not because they are of different species, but because they are under different conditions.

Hence, it has long been suspected that the bacilli, etc., are rather the carriers of disease than its direct producers; and the inquiry has been directed toward what it is that they carry. Is it a chemical poison, or what?

The question now seems on the verge of a reply to the effect that it is some semi-organized ferment, something of the same nature as pepsin, pancreatin, etc., but differing from these normal and health-giving ferments, in that its action is destructive or injurious to the living animal cells, impeding their functions, or attacking their integrity—resembling, therefore, the so-called *ptomaines*, and similar products of decomposition and putrefaction. In the living blood a fibrin-ferment may be rapidly liberated, which will deteriorate the blood-cells and lead to septicæmia.

The introduction and production of these ferments—which have not yet been isolated and studied in any large number—are very generally associated with germ-migration and reproduction, but not always; and there is strong evidence for the be-

lief that this is only one of several ways by which the healthy system becomes exposed to their action.

The immediate future of the study of the causes of disease lies in the separation of the coincident phenomena from the real cause, and in the identification of these semi-organized ferments. The field thus opened is even a more difficult one than of microscopical life; it belongs to pathological chemistry, and the methods for its successful exploration have scarcely as yet been discovered; but we may rest confident that the attention given to this central point of medical science will not long remain unproductive of practical results.—*Editorial in Philadelphia Medical and Surgical Reporter.*

A READY METHOD FOR THE DETECTION OF THE BACILLUS TUBERCULOSIS.

Dr. M. B. Hartzell thus writes in the *Med. Times*, January 26, 1884:

Since Koch first announced the discovery of the bacillus tuberculosis, methods for its detection have multiplied rapidly. Most of these methods, however, are more or less complicated, are uncertain, and require too much time for their execution to be of use clinically.

On account of its simplicity, and of the short time required to execute it, I wish to add another to the many staining processes already in use. This process appears to me to possess decided advantages over all others with which I am acquainted; by means of it the sputa of patients who are supposed to be tuberculous can be easily and rapidly examined, and the bacilli are so deeply stained that if any are present in the specimen under examination they cannot be overlooked, if ordinary care is used. The process is briefly as follows: A small quantity of sputum is spread as thinly and evenly as possible upon an ordinary glass slide; it is allowed to dry, which takes but a minute or two, and is then passed slowly several times through the flame of an alcohol lamp or Bunsen burner. One or two drops of the fuchsin solution, recommended by Gradle, and

prepared as follows—carbolic acid, m. xv ; distilled water, f. ʒ ss ; dissolve, and add saturated alcoholic solution of fuchsin, f. ʒ ss —are placed upon the sputum thus prepared, and allowed to remain from three to five minutes. The slide is now washed thoroughly with distilled water, to remove the excess of fuchsin, and the stained sputum completely decolorized by means of a saturated solution of oxalic acid. It is again thoroughly washed in the distilled water after the decolorization, and allowed to dry. It is now ready to be mounted in glycerin or balsam for examination. With a power of five hundred or six hundred diameters, the bacilli will appear as brilliant red rods, no staining of the background being necessary.

In all other methods with which I am familiar, the decolorizing agent employed is dilute nitric acid ; but this, besides being disagreeable to handle because of its corrosive and staining properties, is apt to remove the color from the bacilli too, unless great care is taken. Oxalic acid, however, seems to leave the dye untouched in them.

To render the process still clearer, the different steps may be arranged thus :

1. Spread the sputum upon the slide, dry, and pass through the flame of the lamp.

2. Stain with the fuchsin solution three to five minutes.

A very beautiful slide of "pollen" has been received from Edward G. Day, of Riverside, Conn.

On account of the illness of the writer, the third paper of the " Studies in Histology " is postponed until the June number.

" THE MICROSCOPE for April has an interesting article by E. S. Congdon, on Microscopy One Hundred and Fifty Years Ago." —*Index.*

A very unique slide of five amphipleuræ pellucidæ,arranged in line, and obtained from different localities, is the gift of W. A. Clapp, New Albany, Ind. It is handsomely done.

Correspondence.

Editor of THE MICROSCOPE:

I have a first-class test slide of P. Angulatum mounted dry on thin cover glass, in black varnish cell. About a year ago beads of moisture appeared on the slide, which since then have gradually increased in size. Will they continue to do so until the mount is entirely ruined? If so, can anything be done to save it?

HAROLD PLOWE.

DR. STOWELL,

Dear Sir: I send you slide of Desmids, &c., a dip from a small zoophite case—no preparation, the drop was put in a cell, then the water was absorbed by strips of blotting paper; then a mixture of (carbolated) mucilage of Gum Arabic and solution of Borax, was mixed in a watch glass, a drop put on the desmids, covered and ringed. My object is to call your attention to the medium. Of course, it is a well-known fact that a solution of Acacia and Borax will gelatanize in a few minutes, it then dries up to a vitreous scale. I have never seen this suggested as a mounting medium, it is easily managed and may be valuable for desmids, &c., provided it has no bleaching or shrinking property—time will decide. I see new mediums are in order. If this proves of use, I have no desire to keep it in the background. You may like to experiment on tissues with it. Try high powers on some of the empty desmids.

The long desmids are not figured in any of the few books I have. Would like the name of them. Of course I have nothing especially beautiful about this slide, except to call your attention to the medium, and when it suits your convenience will be glad to hear from you. I have not tried it on diatoms.

Yours truly,

E. E. JACKSON.

The desmids mounted as described by Mr. Jackson show well at this time.

Reviews.

HOUSEHOLD CONVENIENCES. 12mo., pp. 240. Ill., 220. 1884.

FARM CONVENIENCES. 12mo., pp. 240. Ill. 212. 1884.

The above companion volumes are issued by the Orange Judd Company, of 751 Broadway, New York. They are handsomely embossed in gold, and substantially bound. It would be impossible to give anything like a review of these works. They contain a thousand little things, suggestions how to make conveniences about the farm and household. They tell how to make scores of "helps" that go towards reducing to a minimum farm and household labor. You will be surprised to learn how many "conveniences" can be made at home.

EASY LESSONS IN VEGETABLE BIOLOGY, or Outlines of Plant Life. By Rev. J. H. Wythe, M. D., author of "The Microscopist," etc. 12mo., pp. 94. Ill., 36. Phillips & Hunt, New York, 1883.

This work was prepared for the students of the Chatauqua Literary and Scientific Circle. It begins with the simplest facts of biology, and gradually leads to things more complex.

The different kinds of living matter; the differences between living and non-living matter; the vegetable cell; these, with ten other subjects, make up the contents of this interesting little volume. Although quite elementary, yet it is a book that can be read with profit by all in any way interested in microscopical work.

THE CENTURY. Union Square, New York.

The May number of this interesting magazine is before us. Some of the more prominent articles are: "British Fertility," in which the writer gives some startling facts to prove that across the Atlantic "the birds and animals are not only more numerous than at home, but also characterized by greater persistence and fecundity"; "The Women of the Bee-Hive," giving some new features to the Mormon question; and "Chief Joseph," who has a very striking face, as shown by a full-page engraving.

THE AMERICAN HOMŒOPATHIC PHARMACOPŒIA. Second Edition. By Joseph T. O'Connor, M. D. Large 8vo., pp. 511. 1883. Published by Bœricke & Tafel, New York, and Chicago.

This work will be welcomed by all homœopathic physicians and pharmacists. It gives all directions necessary to enable either the physician or pharmacist to prepare or obtain the exact article used by the prover of any drug.

The work appears to include all medicinal substances used in homœopathy. Prof. T. F. Allen, of the University, and editor of *The*

Medical Advance, is given the credit of having rendered valuable aid in the department of Botany.

The publishers have spared no trouble or expense to secure a good work. They should have the liberal support of their homœopathic friends.

THE BACTERIA. By Charles S. Boynton, M. D. Pp. 18. Rutland, Vt. 1883.

IODOFORM IN DENTAL SURGERY. By C. F. W. Bödecker, D. D. S., New York City City. Pp. 12. 1884.

MICROSCOPIC ORGANISMS IN THE BOWLDER CLAY OF CHICAGO. H. A. Johnson, M. D. B. W. Thomas, F. R. M. S. Pp. 8; fig. 8. Chicago, 1884.

YEAR-BOOK OF PHARMACY and Transactions of the British Pharmaceutical Conference. 1883. 8vo., pp. 670. J. & A. Churchill, 11 New Burlington St., London. Price, 10 shillings.

THE BIRTH AND GROWTH OF MYTH. By Edward Clodd, F.R.A.S. Price, 15 cents. J. Fitzgerald, Publisher, 20 Lafayette Place, New York. For sale by Willis Boughton, Ann Arbor, Mich.

This work forms No. 54 of the "Humboldt Library of Popular Science." It comprises twenty chapters, with an Appendix, and gives a very intelligible account of the origin and development of mythological stories. from the scientific point of view.

ADDITIONAL EXCHANGES, CONTINUED FROM LAST PAGE.

(This is a very interesting column to those engaged in practical work. Send on your notice and enter the list.)

I WILL send a quantity of good diatomaceous material containing Baccillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Englena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

I HAVE the following publications: Fresh water Rhizopods of North America, by Joseph Leidy, 4th, 333 pp., and 48 plates, 1879. U. S. Expl. of the 40th Parallel—King. vol. VI. Microscopical Petography, by F. Zirkel, 4th, 309 pp., and 12 plates, 1876, which I would like to exchange for Journals, Transactions, and Proceedings of Microscopical Societies, or Books and Pamphlets treating on microscopical studies. Very respectfully, A. WOODWARD, 206 W. 128 St., New York City, N. Y.

FOR EXCHANGE.—I will send human trichinous muscle in exchange for names of parties owning microscopes. See April number of this journal, page 88.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

HISTOLOGICAL mounts to exchange for other good slides. T. B. STOWELL, Ph. D, Cortland, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

FOR SALE.—Sections of human teeth with pulp in situ, $1.00. F. A. JACOBS, Newark, O.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

MR. FASOLDT, of Albany, N. Y., has invented a new nose-piece. It will be advertised in future numbers of this journal. In the mean time address him at his home.

FOR SALE.—Zentmeyer's histological stand, rack and pinion, coarse adjustment. Glass sliding stage with spring and screw. A eye-piece, $\frac{8}{10}$ and $\frac{1}{5}$ in. objectives. Stage and eye-piece, micrometer, neutral tint camera from Bausch and Lomb. Cost $70. Will sell for $55. New and unused. MAURICE A. MINER, Lake Geneva, Wis.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, JUNE, 1884. No. 6.
WHOLE NO. 23.

Original Communications.

BACTERIA IN DENTINE.

DR. A. M. ROSS.

MY attention was attracted by an editorial paragraph on page 90 of the April MICROSCOPE that ought not to stand as a little matter of scientific news in a scientific journal without some correction.

Little matters are often of very great importance, and if little errors creep into reports upon or statements of certain scientific facts they should be detected at once.

It is a popular way of speaking to say "bony structure" of a tooth or teeth, and it is often indulged in by those knowing it to be erroneous, simply because there is a close resemblance between dentine and bone in their constituents—the former possessing a small per cent. more earthy matter. The larger amount of organic matter possessed by bone being due to blood circulation, etc. But a tooth has no bony *structure* except the covering of the root, and this cementum has no Haversian sys-

tems of blood vessels, though its lacunæ and cunaliculi are like those of bone. The larger mass of tooth substance, dentine, and its covering enamel are structurally unlike bone.

In the next place, if it is to a certain extent true that "great masses of micrococci, bacilli and leptothrix threads pass into the dentinal canals," why is it left to be inferred by the reader that fungi penetrates the normal structure of a tooth? Such an inference would be absolutely unfounded in decay of the teeth, because the dentinal canals thus infested were *first* penetrated by an agent that softened the structure. An agent is active in softening dentine far in advance of the localities infested by fungi. What the solvent is, how it is produced or maintained in the carious cavity are mooted questions that are not to be settled in any way excepting by research. This fact, however, is well established, and when well understood by *investigation* of the *subject*, it leaves one in much honest doubt about the direct influence of bacteria in causing *decay* of the teeth: The softened dentine, characteristic of decay is *always regular in a curved outline* against the sound portion of dentine, while the penetration of bacteria into this softened mass is always more or less superficial and *very irregular*. None are ever found in the deepest portions of this mass and there are large areas often found in the soft mass in which there are no bacteria of any description.

These facts—and they are only a few of what might be given—are so suggestive that a conscientious investigator will not be trapped into setting up a germ theory of decay of the teeth.

Experiments by Dr. W. Miller go to show that the ferment which produces acid in the mouth is organized, and that substances containing starch are necessary for its formation of acid. The unorganized ferment, ptyaline, is simply a sugar forming ferment. But if it is proved that bacteria produce the acid from certain detritus about the teeth, and that it is this acid which dissolves the lime salts from a tooth, neither does that fact qualify one to say that the disintegrating process is a germ disease, nor to attribute to bacteria a power which it is evident the organisms do not possess, because similar local conditions do not produce like local results.

Human teeth are always more or less exposed to products of fermentation, and if that product is largely acidulous, all teeth should be more or less decayed where that product is most at rest about the teeth. But this is not so. Nor can we compare the teeth to individuals exposed to zymotic diseases where some succumb to the infection, while others do not; because the teeth have no such functional activity as to make a comparison possible.

Of one thing we can rest assured: "Great masses of micrococci, bacilli and leptothrix threads" are in the superficial layers of decayed dentine, extending somewhat into the deeper portion, but not into the *deepest* portion of the soft mass, there doing their work in the economy of nature, but that they are active in any other sense is yet to be proved.

STUDIES IN HISTOLOGY.

LESSON III.

C. H. STOWELL.

SECTION CUTTING.

IN order to examine many of the tissues by transmitted light it is necessary to have them cut into thin sections. Very few of the tissues are in a suitable condition to be submitted to this method of procedure.

Tissues that are of a soft and yielding nature may be examined by snipping off a thin fragment with a pair of scissors with blades curved on the flat. Portions of these sections at the circumference will be found sufficiently thin for examination. If larger sections be desired recourse may be had to a Valentin's knife. This knife consists of two long parallel blades, which can be separated from each other by means of fine screws. The thickness of the section of course depends upon the degree of approximation of the blades. The sections obtained in this way are of limited dimensions and seldom of uniform thickness. It is a method of section cutting but little used and cannot be recommended.

Many tissues prepared for study at the present time are cut with a freezing microtome, although embedding in the well-

microtome has its legitimate place and will in all probability remain in constant use. There are advantages arising from the use of both fresh and hardened specimens, but as a rule the latter will be found the more satisfactory.

There are several patterns of freezing microtomes, some using ice and others ether. The ice-freezing microtomes work very nicely, only it is somewhat disagreeable to charge them, even when ice is plentiful. The ether microtomes give good satisfaction provided the instrument is furnished with good nozzles. It is a pleasure to use one of these well-made instruments; while if poorly made, giving a coarse spray and using much ether, they become a source of great trial.

Tissues that have been hardened after some of the methods already given are best cut by the aid of some microtome. The common well-microtome consists of a stout brass tube closed at one end and fixed at right angles at the other end into a smooth plate of brass, which should be covered with glass. A disk of brass is fitted into the interior of the tube and is acted upon by a delicate threaded screw fastened to the base of the tube. By turning the milled head below the tube, the disk is raised and the section embedded in the tube raised with it. The microtome shown in the accompanying figure answers every purpose. It is well made, has a smooth glass cutting-plate, the diameter of the tube is of good size, the screw is well cut and has a graduated head. The upper surface of the plug has a groove in it to keep the embedding mixture from rotating as the sections are cut.

There is one difficulty with this microtome as with nearly all the others. There is nothing to prevent the embedding mixture from becoming loosened from the surface of the plug and rising in the tube as the sections are being cut; although the groove is pyramidal in shape still it will not hold the paraffin firm enough to prevent this most annoying imperfection. This trouble can be remedied, however, by having a small hole drilled in the upper surface of the plug and by fastening in it a small screw with a broad flat head.

This is the most useful form of microtome that can be purchased for anything less than ten dollars. If three times this amount can be expended then some form of a microtome

should be selected that can be used either as a freezing-microtome or simply as a more common well-microtome. This pattern should also hold the knife in a suitable frame, so attached to the microtome that all movements of the knife may be absolutely free and easy. To use these superb instruments it is only necessary to attach the tissue to a piece of cork with some gum solution and proceed at once to cut the sections. If the tissue be soft and fresh then a few moments suffice to freeze it hard with the ether spray. If the tissue be already hardened then as soon as the gum has hardened sufficiently to hold the tissue to the cork the section-cutting can commence. It is better to attach several of the hardened pieces of tissue to corks with the gum solution at one time and then place them in the bottle of alcohol to be used at pleasure. The cork only is placed in the clamp of the microtome while the superimposed tissue is left free for the knife. There is no embedding mixture of any kind; the edge of the knife is entirely free from contact with everything except the tissue, hence never gets injured; the instrument is so carefully graduated that sections can be cut very rapidly, from $\frac{1}{1500}$ to $\frac{1}{2500}$ of an inch thick; and besides the instrument is simple, compact, and always clean.

EMBEDDING MIXTURES.

Solid paraffin, 3 parts Cocoa butter, 1 part Hog's lard, 3 parts	soft.
Solid paraffin, 3 parts Cocoa butter, 2 parts Spermaceti, 1 part	hard.
Solid paraffin, 2 parts Cocoa butter, 1 part Spermaceti, 1 part	harder.
Paraffin, 2 parts Vaseline, 1 part	Transparent and easy to cut.

These are very common mixtures for embedding although Cole, of London, recommends them only to "those who are fond of messes, and the method is mentioned only to condemn it as unnecessary and dirty in every way." Notwithstanding this terrible denunciation, the method of embedding with paraffin will continue to occupy its position as an easy way of holding a tissue firmly in place without injury to it or to the knife.

THE KNIFE.

The knife should be ground so that the under surfaces of its edge and back are strictly parallel. The blade should vary from five to eight inches in length and should be of the best tempered steel, in order not only that it may be capable of receiving an edge, but also that it may retain the edge. The blade should be either biconcave or at least have one of its surfaces slightly concave. A knife appears to work the best when its lower surface is slightly concave and its upper surface more concave still.

METHOD OF USING.

When ready for work only about the quantity of embedding mixture required should be melted. The mixture should be heated just enough to melt it and no more, and a water bath is best for this purpose. If too much heat be applied the paraffin will shrink from the sides of the well of the microtome when cooling, and, also, the high degree of heat might affect the tissue to be embedded.

The tissue is now removed from the alcohol and placed on a piece of blotting paper, which will absorb the excess of the alcohol. The surface of the tissue rapidly dries by the evaporation of the spirit, and when the surface only is dry the whole specimen is dipped into a weak solution of gum-arabic. But few realize the value of this simple step, yet it saves a great amount of trouble and annoyance. The tissue is removed from the gum solution and the surface allowed to become quite dry. It is then dipped in the melted paraffin and immediately withdrawn. The layer of paraffin will speedily harden and will protect the tissue from the more prolonged heat of the embedding mixture when placed in the microtome.

The tissue thus prepared is placed in the well of the microtome, close to that edge of the tube which is situated nearest the edge of the knife as it rests on the glass plate ready for cutting. The melted paraffin is slowly added until the tissue is completely covered. As the paraffin shrinks in cooling it is best to have plenty of it over the top of the specimen that it may not become again uncovered.

When the paraffin is sufficiently hard, the microtome is clamped to the table and the operator is seated on a chair before it. To the right is a large soup plate and a saucer, each filled with equal parts of alcohol and water. A chamois or piece of soft linen is near at hand. The knife is firmly grasped in the hand and dipped in the plate, carrying in its upper concave surface a quantity of the dilute alcohol to the surface of the microtome. A few turns of the microtome screw raises the paraffin, when a thick slice is cut off. This is repeated until the knife has passed once through the tissue.

The knife should be pushed obliquely from point to heel; a direction forward and to the left. After each section the blade should be wiped on the chamois or linen, to remove any pieces of the embedding mixture from its edge.

A partial revolution of the milled head raises the embedded tissue above the surface of the microtome; the knife is dipped in the dilute alcohol and a quantity of it carried to the surface of the microtome, which is kept flooded all the time; a rapid push of the knife removes a section which is carried into the saucer and floated off; the section clears itself from the embedding mixture owing to the layer of mucilage coating its surface and falls to the bottom of the dish while the oily paraffin remains at the top, to be floated off.

WHAT IS THE AMERICAN FORM OF PARAMÆCIUM AURELIA?

DR. ALFRED C. STOKES.

MOST statements as to the results of all observations, microscopical especially, and whatever their source, must justly and necessarily be received with some hesitation until confirmed by an independent worker. The declarations of James Clark, Carter or Leidy, who have become illustrious as learned naturalists, accurate observers and conscientious narrators of scientific truths, are usually accepted without that semi-reluctant feeling that the statement is remarkable and that one would like to verify it, probably because they have proved themselves to be so perfectly honest. But no human being is infallible ex-

cept, of course, the Pope, and it is scarcely surprising that the latest English writer on the Infusoria should occasionally repeat some of Carter's or Leidy's assertions with an air of doubt. If Kent has been unable to verify Carter's statements, it is his duty to say so, and when any other worker in the same department is able to add even a single fact confirmatory of either observation it is no less his duty to be not " backward in coming forward."

The formation of the contractile vesicle in an Infusorian ordinarly invisible, and the presence or absence of a brush-like tuft of cilia at the posterior extremity of the small little creature, may seem like anatomical niceties hardly worthy of attention, but every fact is important, and every addition to the sum of human knowledge though it may be infinitesimal, will add somewhat to the sum of human happiness either here or hereafter.

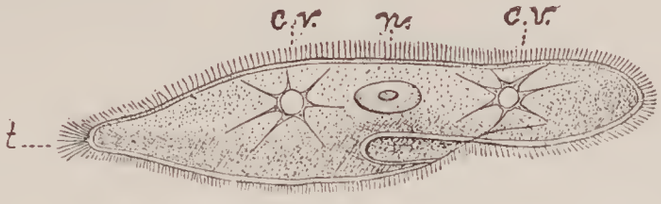
In reference to the pulsating vacuoles of the common *Paramæcium aurelia*, mull., Kent states that the stellate contour at diastole is probably the result of abnormal pressure. The effect can be produced by any one by the use of a thin cover without a supporting cell. In a situation where the animalcule's movements are much restricted by the pressure, the two contractile vesicles, even previous to systole, have developed about their margin often as many as eight lateral, pyriform vacuoles which, at the moment of contraction are left to coalesce and so produce, in part, the ordinary, spherical vesicle. Kent adds, apparently with doubt, that "according to Carter" these pear-shaped vacuoles are prolonged as thread like channels through the substance of the infusorian.

Having recently examined numerous specimens of Paramæcium from a distant locality, I have been able to corroborate Carter's statement. The appearance is an interesting one. From almost every pear-shaped vesicle the small or stem end is elongated as a fine but conspicuous channel which is finally lost in the parenchyma. Some of these filiform canals are occasionally persistent, but when the accessory vacuoles are visible, they can be followed up, down, through and around the endoplasm in a beautiful star-like pattern. A minute, spherical vesicle first reappears centrally after cystole, which, gradually en-

larging, finally receives the contents of the pyriform diverticula, assumes the mature phase and contracts, again leaving the secondary vacuoles with their long canals.

In reference to the posterior tuft of cilia, the statement is made by the English authority that, although Claparede and Lachmann delineate it conspicuously, he regards its presence as "signalizing a well-marked local modification, but certainly not the predominant types of this cosmopolitan species." May it not be just possible that the absence of the brush-like tuft signalizes the local variety? May not the smooth-tailed Paramæcium be the variety common to English writers? According to my observation it is not the American form. All those lately received, as well as those native to my own neighborhood, possess this posterior appendage beautifully developed. Will not microscopists, who may have access to this infusorian, particularly notice the ciliary clothing of the posterior extremity, and so aid in determining what the usual American form may be?

The figure represents the animalcule with the stellate contractile vesicles *c. v.* and the posterior brush-like ciliary tuft *t.* magnified 200 diameters.



THE ST. LOUIS MICROSCOPICAL SOCIETY.

FRANK L. JAMES, M. D.

IT is with a keen sense of gratification that I am enabled to write to you and through you to the readers of *The Microscope*, the fact that Saint Louis has at last a real, live *Society of Microscopists*, something that—to our shame be it said—she has not had before in several years. Among the first of American cities to organize a society, it was allowed to languish and die—die with a full roll of members and with funds in the treasury! Was such a thing ever heard of before? It was not from lack of *talent* among the members,—for the muster roll of the old society embraced names known not only all over America, but all over the world, as earnest, scientific workers. The trouble was that the membership was confined exclusively to the medical profession in its most orthodox and straight-laced form.

They were mostly men of large "practice" and as a consequence did not have time to meet and work. Then there were jealousies among the individual members which *would* crop out when they did meet; so the meetings grew gradually smaller and smaller, until one rainy night some ten years ago, the hall was lit up and only one man—the secretary, faithful to the last, put in an appearance. After waiting awhile he adjourned himself *sine die.*

When I commenced agitating the matter and urging the necessity of a society here, I met with several members and officers of the old society. They urged the reorganization of the old body, pointing out the fact that its charter was still valid, its roll of membership embraced quite a number of prominent men, and that there was a fund in the hands of the treasurer which could be utilized. These reasons were good ones, but against them stood the fact that these men had allowed one society to die of inanition, and were hardly very promising material out of which to build up a body of workers, who would make themselves felt in the science of microscopy. However, the attempt was made and failed. A half dozen or so of the old members met—among them the last president and secretary, and after passing a resolution directing the secretary to call a meeting of the society forthwith, they adjourned. Several days passed and no action looking like revivification was taken, and then we went to work in another way. I got together a half dozen or so of my students, chased in several workers whom I knew, got the daily papers to give us a notice and the result was the organization on the 1st instant, of the *St. Louis Society of Microscopists*, with fifteen charter members present and a half dozen names to be added—the parties not being able to be present on so short a call. The following officers were elected to serve during the ensuing year:

President, F. L. James, M. D.
Vice Presdent, W. B. Hill, M. D.
Secretary, R. Ohman-Dumesnil, M. D.
Treasurer, Thomas F. Rumbold, M. D.

The society is modeled after the American Society of Microscopists and the membership will be confined to no profession, school, sect, clique or sex. All workers with the microscope of respectable social standing are welcome to our ranks, and I think we are destined to have a large and influential membership.

Editorial Department.

ROCHESTER MEETING.

In our next issue we shall have something to say about the approaching meeting of the American Society, at Rochester, N. Y. We shall then tell just how each member can have a copy of the proceedings to read at his leisure in thirty days from the date of adjournment. We may be rash enough to state that it is to be hoped the whole society will not become buried in diatomaceous material.

We may ask if the criticism of "Science" is just, when it said in its issue of April 11th., that the twenty-six papers "are mostly by amateurs, and show it, for the most part, more plainly than is consonant with a high scientific body." This wonderful periodical further states that "there is not more than a single communication which appears to be the result of a serious and prolonged research by an experienced investigator."

Bnt our ideas on this subject will appear in due time.

While we shall make a special effort to have our next number present the interests of the American Society, yet in the meantime we hope many of our readers will prepare live, practical questions and papers for the meeting of that body.

Let us realize in these young days of microscopical science that the question is not "how much of microscopical literature have we at command" as it is "*How perfect are our methods of work?*"

NEW APPARATUS.

We have seen lately two very fine pieces of apparatus. The one is a self-centering turn-table, the invention of Mr. E. H. Griffith. The junior editor accepts the gift with becoming modesty. A prominent microscopist said to us a few days ago that "turn-tables were only good to throw at cats," but we fear there will be trouble in our family if he should ever come West

and put this turn-table to such nocturnal uses. The only trouble our Eastern friend would experience in using this instrument would be: the table turns so easily on its pivot that once started it is very difficult to stop. In fact when thoroughly under way, Mr. Griffith says himself, it frequently takes a mount-o'-cat or a cat-a-mount to stop it.

The other piece of apparatus is a microtome that, like many others, can be used either as a freezing-microtome or as the more common microtome. It will cut sections to perfection as thin as the $\frac{1}{1200}$ part of an inch, and it can cut one-half as thin as that.

The instrument is made in Germany and costs, with duty, about forty dollars. It is owned by Dr. S. Duffield, of Detroit. The doctor is a very fine microscopist and, as a result of his labors at home and abroad, has a valuable collection of mounts. We hope to meet him and his microtome at the "working session" of the Rochester meeting.

A CONUNDRUM.

Who is to be our next President?

As nothing like politics is ever known to enter a body of scientific men, therefore the above question must refer solely to the late meetings at Chicago instead of the coming meeting at Rochester.

REWARD OFFERED.

LOST.—*Reward Offered.*—A copy of "Heitzmann's Microscopical Morphology" will be given for any information that will lead back to the ranks of microscopical science a man who was seen to come from the printing house of J. H. Vail & Co., of New York, in 1883. He had on a garment of an intranuclear and intracellular network of minute fibrils and started in a direction that would lead to the overthrow of the cellular doctrine and the upbuilding of a new bioplasson theory. As nothing has been heard from this person since objectives have been properly adjusted and accurately focussed, the above reward is offered.

Correspondence.

To the Readers of THE MICROSCOPE:

At the annual meeting of the American Society of Microscopists, to be held in Rochester, N. Y., commencing August 19, 1884, one entire session is to be devoted to practical illustrations of the methods of work by experienced microscopists. Tables will be arranged in a room or rooms provided for the occasion, which will be occupied by experts in microscopical work.

Every experienced worker of the Society is earnestly solicited to write at once a short description of any of their own satisfactory methods of mounting or of preparing material or of making accessories for the microscope or of anything of general interest in connection with microscopical work and to send it as soon as possible to the undersigned. These descriptions are wanted at the earliest possible date so that they may be sent to the Publishing Committee to be examined before the next meeting. Address E. H. GRIFFITH, A. M.

Fairport, N. Y.

DEAR DOCTOR:

'Tis like sending "coals to Newcastle" to send you the skin of a silk worm, but it may be a new process; it certainly saves tedious dissection. A worm is soaked in acetic acid for ten days or more, and then opened carefully with scissors from anus to mouth and washed in water. The respiratory apparatus, tracheæ, &c., all seem perfect for mounting. I soak first in weak alcohol, then strong, follow with oil of cloves, then turpentine, and finally mount in balsam.

Yours, &c., E. E. JACKSON.

[Mr. Jackson states in a later communication, that he has heard his process is not a new one. This does not invalidate the method, however.]

"I find an interesting study for the microscope in tartar from the teeth dissolved in warm water. Would like some of your readers to investigate and report. I use a one-inch eye piece, and a one fourth objective."

Items.

AN attempt is being made to mount diatoms in absolutely solid phosphorus.

FOR a good swab for cleaning small vials, test tubes, etc., use a piece of the round leather being sold by dealers in sewing machine supplies.

DISINFECTANTS.—What is the best disinfectant? *Answer*—A high degree of cleanliness. There is no disinfectant besides this that is perfect in its action. If not thorough it is almost useless. Many disinfectants only narcotize disease germs, but do not destroy them.

METHOD FOR DOUBLE INJECTIONS.—The veins are first injected through the arteries with colored gelatine and then a differently colored plaster of Paris is injected in the same way, forcing the gelatine before it, but as this stops at the capillaries, the arteries and veins can readily be distinguished.

"WHAT'S IN A NAME?"—In a Buffalo daily we notice that Prof. D. S. *Killicutt* has prepared some fine slides of *Sephemus Leconti*. Our worthy secretary can well ask the above question. In the same paper is a description of Mr. E. H. Griffith's new "*turn-table for the changing of a view without removing the object.*"

THE WENHAM BUTTON.—To keep the Wenham button or the common hemi-spherical lens in position while examining temporary mounts, fix it with glycerine or immersion fluid to that surface of a slide on which has been turned a wax or an asphalt ring, the internal diameter of which corresponds to the diameter of the lens. Invert the slide and it is ready for use.

THE BEAUTIFUL SNOW.—From the pure and beautiful snow, just fallen, Floegel has obtained living infusoria and algæ, bacilli, and micrococci, mites, diatoms, and great numbers of fungi spores, also fibres of wood, mouse hairs, pieces of butterfly wings, skin of larvæ of insects, cotton fibres, pieces of grass, epidermis, pollen grains, rye and potato flour, grains of quartz, minute pieces of roofing tiles, and bits of iron and coal.

A PRETTY SLIDE.—A very pretty slide, and one very easily made, is the raphides in the sap of the daffodil. It is only necessary to squeeze out a drop of sap from the flowering stem on to a slide, and on its drying, which may occur spontaneously, or be done over a spirit-lamp, we find hundreds of crystals strewn over the field of view. With the polariscope they are exceedingly interesting and brilliant. If we drop over the warmed glass a little Canada balsam, we can press on a cover glass.

SIMULATION OF THE TUBERCULAR BACILLUS BY CRYSTALLINE FORMS.—The memoirs of A. Celli and C. Guarnieri give the results of a large number of observations on the bacillus described by Koch in the nodules of tuberculosis, and in the sputa of consumptive patients, and further call attenton to certain crystals found not uncommonly in these sputa, which, both by their appearance and by their behavior towards anilin colors, imitate the tubercular bacilli. The microscopic differences between the two classes of objects are minutely described.

EXAMINING ALIVE THE HEADS OF INSECTS, SPIDERS, &C.—Mr. E. T. Draper recommends a cone of pasted paper to be made rather larger than the specimen, with the apex cut off. A vigorous spider will soon project its head through the aperture. When in this position it should be blocked behind with cotton wool slightly wetted. The cone can then be gummed to a slip, apex upwards.

Many insects can be arranged in the same way for the observation of facial movements, and such front views admit of interesting and extended study, the action of the antennæ, palpi, and various organs of the mouth may be watched, and curious effects produced by the excitation of saccharine or nitrogenous juices, administered from the top of a sable pencil.

AN INTERESTING EXPERIMENT.—During a recent lecture in the Philadelphia Academy of Pharmacy, glass jars were passed around containing samples of cultivated disease germs. Potatoes cut in halves had been lightly smeared with a coating of substances containing germs. The bacteria were nourished on the moist surface of the potato, and presented very interesting appearances. Different results were obtained from different bacteria. Some of the half potatoes were covered with an or-

dinary deposit of mould. On others the disease germs had developed into thin, peculiarly shaped patches of fungous growth of bright blue, red, yellow, and greenish colors. Others had grown into an intricate and extensive network of fuzzy fibers, the growth on the surfaces of two or three potatoes reaching over and covering a space having a diameter of eight or nine inches.

SOME THOUGHTS ABOUT MOUNTING.—Discussion of various media.—"Some experiments by Mr. E. E. Read, of the Camden Microscopical Society, would seem to indicate that cosmoline may prove a valuable medium in which to mount the starches. The starch grains are certainly remarkably well displayed in it. How permanent the mounts may prove is a question of time. It is not improbable that several of the petroleum products—even the plebeian kerosene itself—may be found not unworthy of the microscopist's attention." "Dr. W. W. Munson some time ago called attention to the preservative properties of a solution of chloral, and the medium is evidently deserving of more attention than it has had. A slide of algæ put up in this solution over four years ago still remains as bright and pure as when first mounted, and, what is quite important, the cell contents of the algæ appear to be less contracted than is usually the case."

In last week's issue of Detroit Every Saturday, Mrs. C. H. Stowell makes an effective reply to the assertion made by Mrs. Stone in her "club talks" in that paper, that the opportunities for social culture afforded young ladies at the University are insufficient. Mrs. Stowell points out the many occasions for making acquaintances that are presented by the choral union, the church societies, receptions and entertainments, local societies and the numerous class socials, suppers and meetings. She reaches the almost unavoidable conclusion that if a University girl fails to acquire social accomplishments, the blame rests upon the girl herself. In concluding her letter Mrs. Stowell says: "Mrs. Stone has certainly been misinformed on some of these matters; for instead of this great want being unsupplied, it is supplied in such abundance that all the advocates of rigid study to-day fear lest the social life of the college girl will become so great that she will be unable to maintain the high standing she has so grandly acquired."—*Register.*

Employment of the Freezing Method in Histology.—Dr. Axel Key and Professor Gustav Retzius reproduce in German an account of the freezing method which had been previously published by them in Swedish. The method is in many cases of great advantage, but it often causes certain abnormal appearances which, without due care, might be taken for actual features in the tissue examined; for example, in fine sections of tendon cut when frozen and fixed afterwards by means of perosmic acid, a series of longitudinal canals were seen; and in sections of brain a regular system of lacunæ communicating with each other appeared to exist which it was quite impossible to demonstrate by means of an injection. All these appearances, in fact, are produced by the freezing method itself; the water contained in the tissues is driven out at the moment of freezing, and collects into lacunæ where there is the least resistance. It is evident, therefore, that the greatest care must be exercised by histologists who make use of this method.

Examination of Urinary Sediments.—Certain urines, especially concentrated urines and those passed in febrile conditions, deposit upon standing a considerable sediment composed chiefly of alkaline urates, and often deeply colored by uroerythrine. The detection of the organized sediments, such as blood globules, epithelium, casts, etc., in such cases is difficult and often impossible. To facilitate the examination in such cases Mehu adds to such sediments, after they have subsided and after most of the urine has been removed, a small quantity of saturated aqueous solution of ordinary sodic phosphate. This dissolves completely the pigments and urates so that the subsequent examination of the sediment is comparatively easy. An excess of the sodic phosphate does do harm, but its addition frequently causes a precipitation of crystalline calcic phosphate. Mehu prefers this method of treatment to the common one in which the urates are dissolved with water. The latter delays the subsidence of the organized elements, and besides tends to soften and break them up.—*Boston Med. Jour.*

Tenacity of Tubercle Bacilli.—It has been doubted whether the sputa of tubercular patients, which are thrown on the streets and later mix with all kinds of dust, would ever

cause the disease. To determine this question, Dr. Vignal (*Deutsche Mediz. Zeitung*, 1884, No. 1) has collected sputa, as they had been expectorated by phthisical persons in the streets. He mixed them with the common street dirt, moistened them, put them on a porcelain plate, suffered them to dry, again moistened them, again let them dry, and continued these experiments for a very long period of time. Then he made inoculation from these sputa in two Guinea pigs; one died a few days later from a different, accidental complaint, the other first became fat—a proof of the experimenter's good feeding—then slowly emaciated, and finally, three months later, died. The post mortem showed a large number of tubercles, many in the state of caseous degeneration, and a great number of bacilli.

This experiment proves that the sputa collecting in the streets and on the floors of dwellings, are by no means innocuous, but serve as pathogenic elements in persons predisposed to this disease.

PREPARING AND MOUNTING SECTIONS OF TEETH AND BONE.—J. E. Ady explains as follows what he terms the "laccic" method of occlusion.

1st. Saw a piece off the tooth or bone, rub it flat on an engineer's file, polish the flat surface on a fine hone, Water-of-Ayr stone being preferable.

2d. Fasten the section to a piece of plate glass, one inch square, with a cement made by melting six parts of "button" lac with one part Venice turpentine.

3d. File the section down moderately thin, and then reduce further on the Water-of-Ayr stone, examining from time to time with the microscope.

4th. Soak the section off with strong methylated spirit, wash thoroughly in clean spirit, and dry between tissue paper.

5th. Make a thin solution of white shellac in methylated spirit, filter, and keep in a stoppered bottle.

The section is to be dipped in this solution, drained, and laid on a cold plate under a bell-glass. In about half an hour it will be dry.

6th. Mount in cold balsam and benzol in preference, in

order to avoid heating the section, as that would give it a tendency to curl; but as the melting point of the shellac is higher than that of the balsam, the latter may be used if thought desirable, as it may even be caused to boil without affecting the shellac.

MR. W. J. SOLLAS's letter on the subject of cutting sections of diatoms was formally laid before the meeting. It had reference to the paper of Dr. Flögel, read at the December meeting, and was also intended to be read at that meeting, but did not come to hand until the meeting was over, when it was informally communicated to those present. The letter was as follows: "For some time past I have been engaged in cutting sections of diatoms. My plan is to scrape off a green slime from our river mud, consisting chiefly of *Pleurosigma zigzag*—a large species suitable for cutting. The slime, together with some mud, unavoidably gathered at the same time, is placed in a saucer and covered with a piece of muslin, which lies in immediate contact with the mud, while a film of water lies above it. The saucer is now exposed to daylight, and the diatoms creep through the muslin, collecting in a consistent film on its upper surface. The muslin may now be lifted from the mud, it comes away clean bringing all the diatoms with it, but leaving the mud. The muslin with the diatom film is now immersed in the usual hardening and staining reagents. I have used a mixture of chromic and osmic acids and absolute alcohol for hardening; borax-carmine, hæmatoxylin, and eosin for staining. When duly stained and hardened the diatom films may be removed from the muslin without difficulty, and cut, either by embedding in pure paraffin (melting point 58°) and mounting in Canada balsam, or by freezing in gelatine jelly, which allows one to cut *consistent sections which may be mounted direct in glycerine* on a glass slide, without passing through water. By employing these two processes, I have made out the internal structure of diatoms, and believe that I can detect fine protoplasmic threads proceeding from the protoplasm that surrounds the nucleus and passing through apertures in the median keel. I am not yet, however, in a position to demonstrate this with absolute certainty, but hope to do so soon."

AT THE DOCTOR'S EXPENSE.

Even delirium tremens is now traced to a micrococcus: "the worm of the still."

"It's no use to feel av me wrihst, doctor," said Pat, when the doctor began taking his pulse; "the pain is not there, sure, it's in me hid, entoirly."

A French joke: A doctor having bought a lot in the cemetery, consulted a marble-worker in reference to the erection of a family monument. After the details of the bargain were arranged, the artisan complimented the physician on his selection of that particular cemetery. "It is so quiet," he said, "and then monsieur le doctuer must know a great many people there."

"Doctor," said the grateful patient, seizing the physician's hand, "I shall never forget that I owe you my life." "You exaggerate," mildly replied the disciple of Æsculapius, "it would be exactly correct to say that you owe me for fifteen visits, and you will please not forget this fact."

THE JUDGE AND THE CONSUMPTIVE.

"Stop that coughing over there!" cried a New York judge. "Such coughing disturbs the business of the court."

There was a short, painful silence, writes Eli Perkins, during which a pale, consumptive man struggled with himself, then coughed again, and continued it for several minutes.

"I'm bound to stop that coughing?" exclaimed the judge. "I'll fine you $10. I think that will stop it."

"Jedge," said the cadaverous man, "I'd be willin' to pay $20 to have that cough stopped. If you can stop it for $10, you'd better get down off that bench and go to practicing medicine. There's money in it, jedge—money in it!"

We will give a prize of a hundred mounts to any one who will convince us that the Griffith self-centering turn-table is not the best ever offered to American microscopists. Bring your proof to Rochester, N. Y., August 19, 20, 21 and 22.

Reviews.

SHAKESPEARE AS A PHYSICIAN: Comprising every word which in any way relates to Medicine, Surgery, or Obstetrics, found in the Complete Works of that writer, with Criticisms and Comparisons of the same with the Medical Thoughts of to-day. 8 vo., pp. 226. St. Louis: J. H. Chambers & Co.

The author truly and faithfully presents every line and precept found in Shakespeare's writings that bears in any way upon the science of medicine.

It is unaccountable how a man, not a physician, could have such correct notions of diseases. It must be as the author states that "Shakespeare *learned* few things; he *knew* them *intuitively*."

The author shows very clearly, by comparing the views expressed by Shakespeare with those held at the present time, that the expressions of Shakespeare as they relate to medicine are nearly always correct.

It is a book that will have a ready sale, for one copy sold will be the cause of selling a dozen others. It is a long time since a book has been offered to the medical profession that so combines the unique and profitable.

SEXUAL NEURASTHENIA (nervous exhaustion) its hygiene, causes, symptoms and treatment, with a chapter on diet for the nervous. By George M. Beard, A. M., M. D., etc. Edited by A. D. Rockwell, A. M., M. D., etc., New York: E. B. Treat, 1884. Pp. 270. Price $2.09.

This work is published from a posthumous manuscript of the author, arranged and edited by his former associate, Dr. Rockwell.

Dr. Beard was one of the keenest of observers, and anything that ever came from his pen could be read by all physicians with profit.

Dr. Beard paid a great deal of attention to the subject of nervous exhaustion, and he was well prepared to present such a work as this.

It treats of a subject but little understood by the general practitioner, while the free use of clinical cases aids very much

in bringing the practical points before the reader. The work will be appreciated by those physicians who are alive to the times.

DRUGS AND MEDICINES OF NORTH AMERICA. J. U. & C. G. Lloyd, publishers, 180 Elm street, Cincinnati, O. Issued quarterly. Price, $1.00 per year.

The first, April, number is before us. It contains three full page engravings of the plants considered. There is one full page illustration of the natural size of the Clematis virginiana, and one full page illustration of the microscopic structure of the stem of the same plant. The latter drawing is the work of the junior editor of this journal; and that the work is thoroughly and carefully done is shown by the very large number of high notices given it by the medical press. We read from our exchanges: "It is not only accurate but highly artistic." "It is one of the leading features of the number." "Like all the work of Mrs. Stowell, it is beautifully and accurately done." "It is artistically and anatomically correct."

We are prepared to state, for we have had a look or two at the drawings, that Mrs. Stowell's work for future numbers is of as high an order as she has ever accomplished.

A LAKE TOUR TO PICTURESQUE MACKINAC: C. D. Whitcomb, Detroit, Mich. Price, 25 cents.

This is an illustrated book of travel consisting of 120 pages. It describes all the beautiful resorts from Detroit to Mackinac and gives a very interesting account of the latter city. It tells the history of Mackinac Island for many years and even takes you through the straits to Petoskey and Cheboygan.

We intend to take another trip this summer on the elegant palace steamers described in this pamphlet. Before answering the question "Where shall I spend my vacation," send your 25 cents to the address given above.

THE HEART OF THE CONTINENT: H. H. Tammən & Co., Denver, Colorado. Illustrated, pp. 64.

This is a very good description of the country from Chicago to Denver as seen from a car-window of the Chicago, Burlington

& Quincy Railroad. Mr. Tammen offers it as a gift according to terms found in our advertising pages.

AMERICAN METEOROLOGICAL JOURNAL:

We have previously called attention to the prospectus of this journal. The May and June numbers are before us, and they are fully up to the high standard one would expect from such an editor as Professor Harrington. Single copies are 25 cents. Address, W. H. Burr, Detroit, Mich.

A letter has been received from the Rev. W. H. Dallinger, President of the Royal Microscopical Society, of London, stating that he intends to be present at the meeting of the American Society in Rochester.

A summer course in botany will be given by Professor Trelease, of the University of Wisconsin, in the Botanical Laboraatory, corner of Garden and Linnæan streets, Cambridge. from July 7th to August 16th.

ADDITIONAL EXCHANGES, CONTINUED FROM LAST PAGE.

(This is a very interesting column to those engaged in practical work. Send on your notice and enter the list.)

I WILL send a quantity of good diatomaceous material containing Bacillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Euglena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

WILL Exchange mounted slides of various crystals, diatoms, in situ, stellate hairs of plants and micio fungi, for other good slides or material. JAMES E. WHITNEY, Rochester, N. Y.

PATHOLOGICAL, Histological and other well mounted slides will be exchanged for mounted specimens of interest. Lists furnished on application. D. E. HAAG, M. D., Liberty Center, Henry County, Ohio.

WOULD like to exchange a 1-6 objective, 160°, adjustable, for a lower power. A. Y. MOORE, 89 Prospect street, Cleveland, Ohio.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

HISTOLOGICAL mounts to exchange for other good slides. T. B. STOWELL, Ph. D, Cortland, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

FOR SALE.—Sections of human teeth with pulp in situ, $1.00. F. A. JACOBS, Newark, O.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc. W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

FOR SALE.—Slides, double stained, of Bacillus Tuberculosis, 50c. each. DR. W. R, CHITTICK, 83 Lafayette Avenue, Detroit, Mich.

WANTED.—Books treating on microscopical and histological subjects not already in my possession. Will pay cash or give slides in exchange. State name of the work, date of issue, and price. C. H. STOWELL, Ann Arbor, Mich.

WILL Exchange mounts of stained vegetable sections for other mounts of interest. MRS. L. R. LOOMIS, Ann Arbor, Mich.

THE MONTHLY
MICROSCOPE
ILLUSTRATED.

VOL. IV. ANN ARBOR, JULY, 1884. No. 7.
WHOLE NO. 24.

Original Communications.

WAVES OF LIGHT.

SONG OF THE ETHER ATOMS.

BY A. M. S.

Away and away.
Take the thrill of my motion,
The throb of my pulses,
And bear it along;
Where light never passeth,
Where day never cometh,
Away and away.

The planets are calling,
The darkness is waiting,
We thrill like a soul,
Though we're lifeless and deathless;
Oh, speed through the gloom,
Through the night of the ages,
Away and away.

CYNIPS QUERCUS-CORNIGERA AND HER GALLS.

DR. ALFRED C. STOKES.

NONE of our forest trees are so frequently attacked by the gall-flies as the oak. The punctures, the injected poison, the presence of the minute eggs, one or all of these causes compel the tree to bear the deformities on its limbs, twigs, leaves, buds, and even on its flowers and roots, while the excresences themselves are as diverse in size, form, color, consistence, and degree of roughness as in position. A peculiar deformation is the one following the punctures of the *Cynips quercus-cornigera*, *Osten Sacken.*

A tree near my home is as heavily loaded with these galls as any cherry tree with cherries in June. They are olive green in color, remarkably hard, and vary from the size of a hazel-nut to that of a walnut, becoming somewhat spherical by growth around the twig. Their surface is studded with brown spines projecting one-fourth of an inch or more, and arranged in irreg-

Fig. 1.

ular longitudinal rows (Fig. 1), while they consist internally of a whitish tissue, spongy but dense, in which are embedded the prolonged bodies roughening the surface. The latter are woody externally, usually extending to the centre of the growth being closely embraced by the gall tissue, but separable from it, and when mature tapering from a rounded base to a sharp often curved apex. Each is entirely distinct from every other, and each is separated within by a transverse woody partition into two unequal cells, the lower and smaller containing the plump little

white larva or the pupa, the larger being empty and occupying the rest of the capsule (Fig. 2). They are sheaths developed

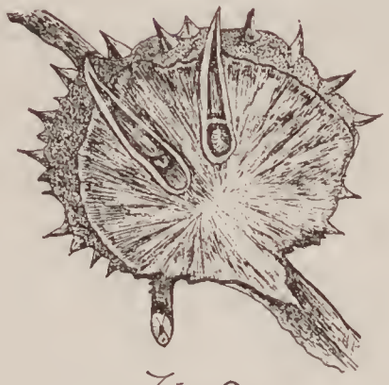


Fig. 2.

about the insects' eggs. From this hard case the mature gall-fly must gnaw its escape after forcing a passage through the partition wall below, and creeping up the hollow stem. What instinct directs this little Cynips in the darkness of her prison so that she knows when she has ascended above the gall-tissue, and why does she never mistake the proper point where she must gnaw her escape? Does she creep up until lessening space forbids further progress and there bite the little round hole she always makes? Born in darkness and matured in a dungeon a hunch-backed gall-fly is wiser than the children of light.

Her body is but one-tenth of an inch long, glossy and almost black, her wings expand perhaps one fifth of an inch from tip to tip; her mandibles, as might readily be inferred, are large and strong, and the end of her ovipositor is saw-toothed. Of her genus there are said to be one hundred and fifty known species, and in a majority of them the males have never been seen. A German entomologist examined 15,000 specimens without finding a single male. He had 28,000 galls of another species, rearing 10,000 Cynips, all of whom were females. Osten Sacken alone claims to have seen a single male.

It is not to the entire insect, however, that I wish to call special attention, but to a few points in her anatomy, and to the woody capsules within the gall. Without dissection of the abdomen, and without the microscope, it would be difficult to imagine the origin of these spinous projections.

The ovaries consist of many minute tubules collected into two sets, each cluster radiating from a centre. Within each tu-

bule the eggs are arranged in a single row, and each egg is prolonged into a stem twice its own length, the egg-cell proper always being directed toward the oviduct, while each stem is curved around the body of the egg immediately in its rear. Figure 3

represents this peculiar arrangement, with isolated eggs to show the stem and its distal enlargement. A facetious friend suggests that the former resembles the arrangement of the monkeys' tails when those animals form themselves into a living suspension bridge across a tropical stream.

These pedunculated eggs and the irritating poison are the insects only contribution to the gall. With the serrated tip of the ovipositor she makes an incision in the bark somewhat after the manner of the saw-flies, deposits the eggs with their stems directed upwards, and troubles herself no more. The egg proper develops into the grub-cell, the stem into the hollow projecting spine, and the woody partition in some way insinuates itself between the ovum and the peduncle. As the whole matures it becomes surrounded by the hard capsule from which the fly must gnaw her freedom. The remains of the membranes are distinguishable as a delicate, colorless, transparent lining within the spine. The length of the egg, including the stem, as it lies in the ovarian tubule, is $\frac{1}{50}$ inch; the length of the mature spines roughening the gall is about $\frac{7}{10}$ inch, an increase comparatively enormous.

There are many interesting queries, unanswerable except by inference, in connection with the development, the food and oxygen supply of the larvæ, and the time at which the mature fly escapes. Out of the same gall, direct from the tree, I have removed larvæ, pupæ, and flies in December and February, and in June I have taken the larvæ, and observed a single Cynips escaping. When are the eggs deposited, when does the image appear?

The grub in the lower cell of the capsule, which it snugly fills, is removed from the atmosphere by the egg membrane, the capsule walls and the thickness of the gall tissue. The sup-

ply of oxygen therefore must be only that which can filter through all these barriers; with how little must it be satisfied?

And the food on which it grows so plump must also pass through the same way. The larvæ of some species are said to feed on the substance of the gall, but such is not the case here. The excrescence is intimately connected with the tree since, when the branch dies, the gall becomes a brittle, brown lump of dead matter inclined to be puverulent within. The circulation, even the very limited circulation of the winter, is essential to the life of the tumor and of the larvæ, but that the latter absorbs nutriment from the sap although probable is only an inference. The whole subject needs investigating. It is a field into which some student ought to delve.

STUDIES IN HISTOLOGY.

C. H. STOWELL.

LESSON IV.

STAINING.

IN order to render the minute structure of tissues more clear and distinct it is usual to submit the cut sections to the action of some of the staining fluids. Some of the staining reagents will give a uniform color to the section while others will stain the different parts of a tissue unequally. As a general rule it may be stated that slow staining in weak solutions gives better results than rapid staining in stronger solutions, yet it becomes necessary many times to use the stronger solutions, staining rapidly, and the results are generally satisfactory. There is a very long list of staining reagents and it is difficult to understand for what special purpose they were compounded.

A very few solutions will answer for all general work and only a very few more for special work. There are three stainings that are good in every place and are therefore in constant use, hæmatoxylin, carmine, and picrocarmine.

HÆMATOXYLIN OR LOGWOOD STAINING.

An aqueous solution is made as follows:

Hæmatoxylin, dried extract, - -	60 grains.
Alum, pulv., - - - - - - - -	180 grains.

Rub thoroughly in a mortar and add slowly 300 c. c. of distilled water, mix carefully and filter. To the filtrate add 20 c. c. of absolute alcohol. Preserve in a stoppered bottle. It should be kept in a cool place, and the older it becomes, the more excellent it is.

An alcoholic solution is made as follows:

Make three saturated solutions.

a. Calcic chloride in 70 per cent. alcohol.

b. Pulverized alum in 70 per cent. alcohol.

c. Hæmatoxylin in absolute alcohol.

Mix one part of *a.* in eight parts of *b.* and to the mixture add *c.* drop by drop until there is a deep purple color to the solution. Use only a small quantity of absolute alcohol for *c.* as the logwood is very soluble. The color deepens and improves with age. A few drops of this solution added to a watch-glass full of water will make it of the proper strength for use.

Alcoholic solutions of logwood do not require to be filtered so frequently as the aqueous solutions.

Sections should be left in the staining until they have acquired the proper depth of color. This is ascertained by taking out a section now and then and examining it. If not stained deep enough they should be submitted longer to the action of the coloring solution. If stained just deep enough they should be washed in distilled water and then placed in alcohol. If stained too deeply they should be transferred to a solution of acetic acid for a short time. The strength of the acid solution will depend upon the amount of color it is desired to remove from the specimen; varying then from a five per cent. to a fifty per cent. solution. The action of the acid should be carefully watched and when the color has been sufficiently reduced the sections should be transferred at once to alcohol.

CARMINE STAINING.

Beale's carmine staining.

Carmine,	10 grains.
Strong liquor ammonia,	½ dram.
Price's glycerine,	2 ounces.
Distilled water,	2 ounces.
Alcohol,	½ ounce.

The carmine, in small fragments, is placed in a test tube and the ammonia added to it. By agitation and by the aid of the heat of a spirit lamp, the carmine is soon dissolved. The ammoniacal solution is boiled for a few seconds, and then allowed to cool. After the lapse of an hour, much of the excess of ammonia will have escaped. The glycerine and water may then be added and the whole passed through a filter or allowed to stand for some time and the perfectly clear supernatant fluid poured off and kept for use.

BORAX CARMINE.

Place a dram of the best carmine in a mortar and add to it two drams of a strong solution of ammonia. Let it stand for twenty-four hours. Take four ounces of a saturated solution of borax in distilled water and rub down the carmine and ammonia with it. Filter and keep in stoppered bottles.

All carmine stained specimens are improved by removing the excess of staining with water and adding a one per cent. solution of acetic acid. The acid takes out the superfluous staining, fixes it in the nuclei and brightens the whole coloring. In place of the solution of acetic acid in water, a fixing solution of one part of hydrochloric acid in five parts of alcohol may be employed. The sections should be closely watched or all the color might be removed. They are then placed in common methylated spirits until required for mounting.

WOODWARD'S VIOLET CARMINE.

This is a very pleasant mixture to work with and is pre pared as follows:

Best carmine, - - - - - - - - -	15 grains.
Borax, - - - - - - - - - - - -	1 dram.
Water, - - - - - - - - - - - -	5½ ounces.
Alcohol, (95 p. c.), - - - - - -	11 ounces.

Mix and filter. The filtrate should be thrown away. On the filter will remain the crystals. The filter paper with the crystals is placed in a mortar and thoroughly mixed with eight ounces of water. This solution is filtered, and the filtrate evaporated to four ounces when it is ready for use. After the section is stained a lilac color, taking from thirty seconds to one minute, it is placed in a fixing solution composed of

Hydrochloric acid, - - - - - - - - 1 part.
Alcohol, (95 p. c.), - - - - - - - 4 parts.

Here it is allowed to remain until the lilac color changes to a rose red. The muclei are particularly stained a bright red.

PICROCARMINE STAINING.

This is a double stain and is one of the most valuable of the coloring reagents. It is prepared by making a two per cent. solution of picrocarmine crystals in distilled water and filtering. Sections are seldom overstained in weak solutions of this reagent and they appear to improve with age. There are a large number of methods described for making the various solutions, all slight modifications of each other. Picrocarmine is valuable simply because the picric acid stains certain parts of the tissue yellow while the carmine imparts a red to the other parts.

SULPHINDIGOTATE OF SODA STAINING.

A saturated solution in distilled water is kept in stoppered bottles. A beaker is partly filled with alcohol and enough of the soda solution added to impart a sky-blue color to it. The specimens are stained at the same time they are dehydrated.

EOSIN STAINING.

Tissues become stained in a few seconds when placed in this reagent. One part of eosin is added to 1,000 or 1,500 parts of water to make the eosin staining of commerce. It is made also in alcoholic solutions. After staining the sections are placed in a weak solution of acetic acid to remove the excess of color and fix the remainder. It is chiefly employed in double staining.

ANILINE BLUE-BLACK STAINING.

Dissolve one decigram in four c. c. of distilled water, and add to this 100 c. c. of alcohol. This is a valuable staining for the nervous system. It gives a slate-gray color and stains very rapidly.

DOUBLE STAINING PICROCARMINE.

Picrocarmine, as already mentioned, stains certain parts of a tissue yellow and the other parts red.

PICROCARMINE AND HÆMATOXYLIN.

Stain the sections slightly in picrocarmine, wash them well in water, and transfer them to a weak solution of the logwood. This is useful for studying the development of bone, for the mesentery, etc.

IODINE-GREEN.

Make a saturated solution in distilled water and dilute to a one per cent. solution when required for use. It stains rapidly, the staining cannot be removed by washing, and it gives different tints to the different tissues. It is really then a multiple stain.

PICROCARMINE AND IODINE-GREEN.

Stain the sections in picrocarmine and wash them with slightly acidulated water. Then place in a one per cent. solution of the iodine-green, watching them that they do not become stained too deeply. The sections should not be left long in the alcohol when placed there prior to mounting, for it will remove more or less of the green color. Bone, intestine, gland-tissue, cartilage, etc., are beautifully stained, and the parts finely differentiated, by this method.

SULPHINDIGOTATE OF SODA AND CARMINE.

The sections are stained in carmine as though they were to be stained in that reagent only. After fixing the carmine staining in the dilute acid the sections are transferred to a large quantity of alcohol, where they are allowed to remain for two hours or more. They are then transferred to the solution of the soda in alcohol. Two or three drops of the saturated aqueous solution of the soda should be added to each ounce of the alcohol, and the sections allowed to remain in it for four or five hours.

There are a large number of mixtures recommended for double, treble, and even quadruple stainings. Those who are interested in investigating the subject of stains will find a variety of solutions to experiment with.

("Staining" continued in the next number.)

A PECULIAR DUST IN SNOW.

IN February, 1884, a peculiar sediment was accidentally discovered in snow water at St. Joseph, Mo. Dr. H. Christopher needing some pure water for chemical purposes, melted some apparently clean snow, and called my attention to the above-mentioned deposit. Afterwards a fine, feathery snow fell upon a coating of sleet and ice,which covered the surrounding country for hundreds of miles. Upon melting this surface snow, the water was found to contain the same unusual sediment. As the entire adjacent country, and the sand bars of the Missouri river, were covered with ice, it seemed remarkable to find this substance in snow falling upon it. Accordingly this dust was treated with chloro-hydric acid, and heated on platinum foil at a red heat to eliminate any carbon or accidental organic matter. Upon washing it in a test tube, it was found to be so minute that portions of it required hours to settle to the bottom. Thinking it might possibly be of local origin, samples were gathered from different parts of the city, and from the country far from habitations. Some were treated as above, and some simply dried.

Its behavior under chemical examination convinced us of its silicious nature. It was then submitted to microscopical examination and found to consist of flat plates and sharp angled fragments, transparent vitreous pieces, some brownish semi-transparent particles, jet black sharp-pointed pieces, and needle-like spicules. However, every piece fragment or minute needle, showed a clean-cut, sharply defined margin, and no rounded masses with worn sides were found. After a careful examination it was considered volcanic dust. It was compared with sand from Coney Island, Lake Erie, the Mammoth Cave, and the Missouri River. These various sands were much coarser, appearing as rounded masses, destitute of the clean-cut edges of the snow sand. So great was the difference no one could confound the two. In order to guard against self-deception, thinking it might be ashes from anthracite fires, or dust from foundries and blast furnaces, they were obtained and found to present an altogether different appearance.

Some of the snow sediment was given to different observers, with no hint as to its character or origin. They called it volcanic dust. Thus we were gradually forced to the belief in the volcanic origin of the specimens.

In order to pursue the matter further, samples were secured on the Atlantic coast from snow falling with the wind from the east, which would presumably give snow free from dust and sediment, having drifted in from air over the ocean. Sediment was also received from Utah snow. All these presented an appearance identical with that obtained in Missouri. A little later it was compared with volcanic matter from Vesuvius, and a striking similarity was at once apparent. The question naturally arises whence came this strange visitor? Is it cosmic or meteoric dust which the earth in its orbit has encountered? In former years observers have collected, in uninhabited countries, quantities of dust which was considered meteoric, and is described as "little rounded particles of metallic compounds, unlike anything the earth is known to produce, and strikingly like what meteors of that size would be." That is decidedly unlike the snow sediment.

For another reason this snow sand could scarce be cosmic dust ejected from some planet, as such action could not be vigorous enough to throw such minute particles beyond the attraction of the place of their origin; particles so small, no matter how forcibly ejected, could not escape the attraction of gravity forcing them back to their home.

It will be remembered that on August 26th, 1883, one of the most tremendous convulsions known to history wrought immense havoc in Java. Large tracts of country were wrecked, and from Krakatoa tons upon tons of volcanic dust, to say nothing of more bulky material, were ejected with inconceivable force, which coupled with the mighty up-draugh of the eruption must have carried the fine particles almost to the confines of our atmosphere. Having once attained a great altitude, borne by the ever-present air-currents, they would drift for months, and in a comparatively short time encircle the earth, and if they were of the same electrical sign as the earth, for instance, both electro negative, the repellant action of this subtle agent

would prevent their rapid precipitation. Experiments have proved this, and heretofore volcanic dust has been known to remain aloft a long time. Shortly after this eruption at the Straits of Sunda, colored suns and strange glowing sunsets startled the inhabitants of comparative neighboring countries by their wierd appearance. These sunsets gradually spread over the earth, and were noticed in this country first in the latter part of November, and during the winter were at their height.

These reflections could not have been caused by the vapor of water, for reasons we will not stop to discuss, but must have come from finely divided solid matter.

The gradual expansion of this phenomenon over the earth after the catastrophe at Java, and the finding of this peculiar deposit in snow from the Atlantic coast, in Missouri, and in Utah, at a time when the glowing sunsets were bright, force us to the conclusion that after its long flight from Krakatoa, we have imprisoned the cause of this great light under our cover glass beneath our objective.

In confirmation of this, notice the following facts: April 19th and 20th were days of almost continuous rain at St. Joseph, by which the air should have been washed clean of all local or surface dust. On the following day snow fell quite abundantly for a few hours; this was secured in clean vessels and melted. This contained a very limited amount of particles so small as to be quite difficult to handle, but the microscope showed them to be of the same character as their predecessors of the winter. At this time the brilliant sunset had faded to a faint blush that lingered after the ordinary tints of the setting sun had disappeared. Thus the sunsets and the attendant dust were disappearing *pari pasu*, and thereby strengthened our faith in what at first seems a preposterous proposition, viz: the snow sediment is volcanic dust from Krakatoa and the cause of the glowing sunsets.

Since writing the above, some dust from Krakatoa that fell on the deck of the ship Wm. DeGrasse on the day following the eruption, has been received from Mr. Wharton, of Philadelphia. Although considerably coarser, its appearance is so strikingly

similar to that gathered at St. Joseph, we are forced to believe them both to have the same origin.

I have a number of slides of snow sediment and will willingly exchange them for other mounts.

H. W. WESTOVER, M. D.

ST. JOSEPH, MO.

BECK'S VERTICAL ILLUMINATOR AND IMMERSION OBJECTIVES.

BY. A. Y. MOORE.

THERE is no piece of accessory apparatus better adapted to bring out the qualities of our better class of homogeneous immersion objectives than Beck's (or some analogous form of) Vertical Illuminator. Its principle is simple enough: A short tube screws between the nose of the body and the objective. In one side of this tube is a hole—generally about a quarter of an inch in diameter—to admit a beam of light upon a piece of thin glass placed diagonally in the tube and so mounted that a rotating movement can be given to it. When the light strikes this piece of glass it is reflected downwards, into the back lens of the objective, and after successive refractions is brought to a focus upon the object. Thus it will be seen that the objective is its own achromatic condenser, and as the quality of the condenser is the same as that of the objective, a condensation of light takes place which is far superior to that given by the best substage condensers made; for the majority of substage condensers, although they may be of exceedingly wide aperture, are not corrected for chromatism and sphericity to the extent required in first class objectives. Upon the side of the short tube, which contains the thin glass reflector—that is the mounting of the Verticle Illuminator, is generally placed some kind of diaphragm for the purpose of regulating the amount of light admitted to the glass reflector and to confine that which is admitted to certain parts of the glass surface. For if the light be admitted in a narrow beam only, on to the central part of the reflector and

be then reflected downwards to the back lens, it will strike this lens in the middle and will finally reach the object as more or less central light. But if it be admitted to the edge of the reflector it will then pass through the edge of the back lens, and when it reaches the object will be an oblique ray to the extent of half the angular aperture of the objective. When admitted through the entire opening, the light will reach the object as a cone whose angular breadth will correspond with that of the whole angular aperture of the objective.

The conditions regulating available aperture, hold good with verticle illumination as well as with other forms. If an objective whose aperture exceeds the numerical value of 1.00, be used upon a dry-mounted object, the aperture will be reduced, in effectiveness, to that value—that is to say, it will only equal a dry-working objective whose angular aperture is 180°. On the other hand, if the object be mounted in balsam, although the full aperture will become available, the visibility of such objects as diatoms will become very much reduced. Thus it is that resolutions are frequently accomplished with a reduction in strength of image. But this condition need not be produced at all, for we now have mounting media whose indices of refraction are sufficiently high to render a visibility equal to, and in some cases greatly exceeding that of a dry mount. Among the media of highest indices are the solution of phosphorus in bisulphide of carbon as recommended by Mr. J. W. Stevenson, having an index of 2.10; the colorless medium of Prof. H. L. Smith, which closely approaches 2.20, and my own medium (a sulphide of arsenic) having an index of 2.33, as determined by working it into a prism. Any of these media will give results with vertical illumination which are far better than was thought possible a few years ago.

But there is another medium to which I wish to call attention, I have used it considerably during the past few months and find it far ahead of anything I have yet used. It is pure silver. By Brewster it is stated that the refractive index of silver is 3.27. One side of the diatom is burned to the cover-glass and the other side is then coated with the silver. The visibility of a diatom so prepared is four times as great as when dry mounted, or more correctly, in the proportion of 1.84 to .43! The results obtained by

giving such a visibility to the diatom and at the same time utilizing the full aperture of the objective, can hardly be imagined by one who has never seen it. The dots upon *Amphipleura pellucida* are shown in a way which would readily convince those who still deny their existence. Even *Rhizosolmia alata*, yields transverse lines, which, so far as I know, have never been seen by any other method.

The Vertical Illuminator needs the most careful manipulation in order to obtain its best results. A small, flat-wicked lamp should be used, and placed at such a distance from the aperture in the mounting of the Illuminator, that it will come to a correct focus upon the object when the objective is properly corrected. The aperture should be left wide open until this condition has been obtained, and then the diaphragm may be so turned as to allow a narrow marginal beam to enter, which will strike the object obliquely. Then the stage should be rotated or slide turned until the light strikes the object in a direction perpendicular to its lines. In case it be desired to show the dots, the light may impinge diagonally upon the lines, or two beams of light may be admitted.

HOW TO HARDEN BALSAM MOUNTS.

"I wish to learn what is considered the best way to harden balsam mountings for the microscope, quickly and safely; both the pure and that in chloroform, etc. How long should it take with either kind, and what would be the approximate temperature, and best way of maintaining that temperature?"

In reply to the above we can only say that we have never tried to hasten the drying or hardening of the balsam. Should we desire to have a mount become hard quickly, we would use balsam of such a consistence that it was fluid only when warm and quite solid and firm when cold; or as our correspondent suggests we could expose the mounted preparation to a low temperature; this could be accomplished by placing the mount *in a drying oven* or in a *sand* bath. Nearly all specimens, however, can be mounted in warm balsam without fear of injury, and then as soon as the balsam becomes cool it is firm and hard.

Editorial Department.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

The seventh annual meeting of this society will be held at Rochester, N. Y., beginning on Tuesday, August 19th, and lasting four days.

Information from many sources warrants the statement that this meeting will not fall below either of the two that have just preceded it.

It is not the purpose of this editorial to praise any one particular man, but no one can read the official circular of President Cox without thanking the man who first inaugurated, not without opposition, "the sessions for illustration of practical work in preparing and mounting objects, which proved so fascinating and useful a feature of the Chicago meeting." Is this member in any way accountable "for the steadily growing interest in the meetings for six years"?

We take strong exceptions to the severe criticisms given the society in *Science*. We acknowledge we are largely a body of amateurs; for how can we be otherwise? Three years ago it was a question whether an American society could be maintained. How can we, then, "give the results of serious and prolonged research"? There are a few men living who, as the early friends of Spencer, have continued their labors even under the most unfavorable circumstances. But the heavy work must necessarily fall upon the younger and stronger. We have a wealth of reagents, our glasses are almost perfect, and we hope for years of future activity. What is our need? *To understand more perfect methods of work.* Let us keep this clearly in mind, and we shall never become lost in the entanglements of an intracellular network of minute fibrils.

President Cox very wisely says, that:

"Each year shows more plainly the importance of having the papers which may be read, so prepared that they may be left with the Secretary at the close of the meeting, and that the publication of the Proceedings may not be delayed by revisions of manuscript, or for the preparation of drawings."

The readers of this journal well know our feelings on this point. We have lived too long in the busy West; we accomplish too much work ourselves, to rest satisfied with the tedious, tiresome delays shown in the publication of the Proceedings. Of course the trouble is just where our President points out; it is in "the revision of manuscript," and "the preparation of drawings." If the Secretary could have the manuscripts and drawings at the close of the annual session, he could mail the Proceedings to members in thirty days. The improved methods of engraving are such that we know of firms who would engrave the illustrations for all the papers in less than a week. Do not blame the publishing committee. Put the delay where it belongs, and carry out the President's suggestions as quoted above.

Mr. President, I move that the author of each paper presented before this society be *requested* to deposit a copy of said paper with the Secretary before adjournment.

I move that in the future each author be *required* to deposit a copy of his paper with the Secretary before adjournment, and, when illustrated, that all drawings be left with the paper also.

HOW TO REACH ROCHESTER.

We would suggest to our Western friends that they consult our advertising pages before deciding how to reach Rochester. "All roads lead to Rome," and nearly as many lead to the above enterprising city. So we suggest that you go to the White Mountains while you are about it and stop over at Rochester on your return trip.

The September number of this journal will contain a full account of the Rochester meeting.

We have just completed the manuscript for an 8vo. volume of 400 pages. The work will be ready by the first of October if not before. Full descriptions will appear in future numbers.

Correspondence.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

DR. C. H. STOWELL,

My Dear Sir: Your letter of the 21st inst. is at hand, in which you express an intention to be present and take part in the business of the annual meeting of the American Society of Microscopists, which convenes at Rochester, N. Y., Aug. 19th. I am gratified to know that it is in your heart and plans to attend that meeting, and I shall be very happy when I *meet* you there, as doubtless all your friends of the Society will be. If I mistake not, we have not had you with us on the occasion of an annual meeting. My friend, attendance alone can convince you of the genuine enthusiasm and good-fellowship exhibited at one of these gatherings; come and partake of and contribute to the good things of our annual festival.

It seems to me from a consideration of the facts in hand that the Rochester meeting must prove one of the most successful in the history of the Society. The large number who have signified their intention of attending, the numerous nominations to membership and inquiries of microscopists received by me indicate a full meeting. More papers and titles are filed than ever before so long before the meeting. The communications promised are mostly by those whom we hear gladly; so I feel sure that the scientific part of the meeting will be full of interest and surpass that of former years. Important reports are also expected from the Committee on Eyepieces and from the custodians of the Standard Micrometer. The session devoted to work must certainly profit many who desire to witness the experts at work. Several terse papers, designed for this session, on special, original methods have been received. Mr. Griffith, who has charge of this matter, informs me that he has promises of assistance from many prominent manipulators who will explain and illustrate their methods.

It gives me great pleasure to say that letters received by President Cox and myself assure us that Rev. Dr. W. H. Dallinger, President, and Alfred W. Bennett, member of the Council,

of the Royal Microscopical Society expect to be present to represent that Society. The latter gentleman will read a paper.

No doubt you have received circulars from the Local Committee on Soirée which indicates ample provision for that most enjoyable feature of our annual reunion.

The following is probably the outline programme to be followed: Meetings of Executive Committee, Monday evening and Tuesday morning; opening sessions, Tuesday, 2 P. M. President's annual address the same evening; Soirée Thursday evening; working session Thursday afternoon; all other sessions, including Wednesday evening, when the memoir of R. B. Tolles, by Dr. Blackham, will be read, devoted to reading and discussing papers.

The Local Committee will yet announce hotel rates, etc.

Yours truly,

D. S. KELLICOTT.

"FALSUS IN UNO, FALSUS IN OMNIBUS."

MR EDITOR:

In reply to Prof. McCallas' Omnibus article, in which he has embraced a splendid opportunity to ventilate his Latin, I would say I hardly thought it was necessary to understand anything about an omnibus to be able to make a Nose-piece; and as he has expressed his intention not to write any more about it, "May we all rest in peace."

WALTER H. BULLOCH.

AMERICAN SOCIETY OF MICROSCOPISTS.

WORKING DEPARTMENT.

FAIRPORT, N. Y., July 8th, 1884.

It has been decided to devote at least one hour of the working session of the Rochester meeting of the A. S. M. to questions and answers relating to any department of Microscopy. In order to save time also to secure a chapter of valuable information for the Proceedings the questions should be sent in writing to the undersigned immediately, so that they may be distributed among the proper persons for written answers, to be

read and discussed at the time designated—also that the Publishing Committee may select such as they may think best for publication. Veterans in any work, especially in Microscopy, are often asked simple questions which they are unable to answer, and amateurs often desire information which they have been unable to find in books. No name will be read in connection with the communication,and it is earnestly desired that practical questions, no matter how simple, will be sent in at once. If you wish to know what is meant by the standard length of tube—whether a large tube is better than a small one—why an object seen through an objective on one stand looks clear, and hazy when used on another; how to measure angle of aperture; how to determine the quality or the power of an objective or an ocular; how to sharpen your section cutter; or how to cut certain sections; how and when to secure certain kinds of microscopical material; or if you desire for yourself, or for the benefit of others, information of any other kind, please sit down *at once*, write the questions and send them in.

E. H. GRIFFITH.

ROCHESTER, N. Y., JUNE 28, 1884.

DR. CHAS. H. STOWELL,

My Dear Doctor: I am happy to say that all the local committees are indefatigable in their efforts to make the coming meeting of the American Society of Microscopists a complete success. The citizens are taking a lively interest in the preparations and will do much toward retaining our reputation for hospitality.

The Powers Hotel, than which few exist in this country with better accommodations, has been fixed upon as headquarters. The spacious parlor has been reserved for the Reception Committee, and visiting members will be favored with reduced rates. The First Baptist Church, situated almost directly opposite, has been offered for the place of meeting and two large rooms in the same edifice will be arranged for exhibition purposes. The Corinthean Academy of Music will probably be retained for the President's address. The drill hall of the State Arsenal, the largest by far in the city, will be used for the

Soiree and ample arrangements will be made to provide for what will probably prove to be the largest number of microscopes ever brought together for the purpose.

During a recent trip east I met a number of microscopists who have never attended any of the meetings, but who have signified their intention of doing so this year and are looking foward to the event with a considerable degree of interest.

We have been informed that the President and some members of the Royal Microscopical Society will attend the meetings as well as some of those who will attend the meetings of the British and American Associations for the Advancement of Science, so that we are justified in anticipating the largest and most successful meeting which has yet been held. With kind regards I am, Very truly yours,

EDWARD BAUSCH.

A NEW SOCIETY FORMED.

At St. Joseph, Mo. The St. Joseph Microscopical Society was organized in May. We know of no other society of microscopists between St. Louis, Mo., and Denver, Col. The officers are: H. Christopher, M. D., president; R. E. Turner, vice-president; H. W. Westover, secretary.

If any of our subscribers take the publications of Mr. Cole, of London, will they please inform us upon the following points:

To whom did you pay your subscription? How much did you pay? Did you understand this to be the regular subscription price? Have you any knowledge that Mr. Cole ever received your money? We are on track of some very rich news and if we can get enough positive evidence from the above questions our readers may hear something soon in the interests of justice and fair play.

Dr. A. Y. Moore, is forever doing something to startle his friends. He now produces an elegant slide of *silvered amphipleura pellucida*. It is used with a Beck's Vertical illuminator and the results are very fine.

Reviews.

MEDICAL DIAGNOSIS. A guide to the knowledge and discrimination of diseases. By J. M. Da Costa, M. D., LL. D. 8vo. pp. 967. Illustrated. Sixth edition. J. B. Lippincott & Co., Philadelphia, 1884.

There is scarcely a well posted medical man in this country who is not familiar with this work. It has been of incalculable value to the whole medical profession, but more particularly to the younger graduates in their endeavors to discriminate disease. The sixth edition contains much new matter and a number of new cuts. In fact the whole work has been so thoroughly revised that it is essentially a new book. We believe the work has been translated into German and Spanish; a very flattering compliment to the author. There are a few books that the oldest practitioner should have, and that the youngest practitioner *must* have. Outside of the latter the work before us comes among the first. It is a fine reputation for any medical man to acquire, to have his brothers call him "a good diagnostician," and a thorough knowledge of Prof. Da Costa's work will do much toward bringing this about. We know of no work so well adapted to aid the physician in discriminating disease.

DESMIDS OF THE UNITED STATES, and List of American Pediastrums. By Rev. Francis Wolle, Bethlehem, Pa. $5.00.

The above work has eleven hundred illustrations on fifty-three hand-colored plates. All these figures were drawn by the author from personal observation. Besides the plates there are over 220 pages of printed matter, giving a full account how to find, collect, and preserve the desmids and algae, and describing each of the 500 species named in the index, and including a descriptive catalogue to each plate. About ten years ago the author commenced his laborious, yet fascinating, work. At that time only about 160 of the 500 species described in this work were known to American microscopists. The work will at once take rank as the highest authority on the subject of which it treats. How the author and publishers can sell such a book for five dollars is a conundrum certainly.

We trust our readers will supply themselves with this valuable work, for we predict that a work consisting of fifty-three

plates colored by hand, will soon become as valuable as it will be rare.

ILLUSIONS: A Psychological Study. By James Scully. Complete in two parts. Part first. Price, 15 cents. J. Fitzgerald, publisher, 20 Lafayette Place, New York.

The present work is strictly popular in its character, and gives a very clear insight into the curious phenomena which occupy the disputed borderland lying between entire sanity of mind and insanity.

THE CENTURY.

The July number of this welcome journal is on the table, and we notice a number of good things in store for us. Perhaps none of the articles will be more generally read than the one telling of the object, origin, growth, and disbanding of the Ku Klux Klan. The interest in the serial "Dr. Sevier" is kept up. There is food for all from "Academic Degrees" by President Woolsey, to "The Story of Myra" by Julia D. Whitaker.

ADDITIONAL EXCHANGES, CONTINUED FROM LAST PAGE.

(This is a very interesting column to those engaged in practical work. Send on your notice and enter the list.)

AMPHIPLEURA PELLUCIDA or any other test diatom mounted in the new medium having refractive index of 2.4 can be procured from H. H. CHASE, M. D., Geneva, N. Y.

BRILLIANT mounts of crystalized silver exchanged for other first-class mounts, by H. W. WESTOVER, M. D., St. Joseph, Mo.

I WILL send a quantity of good diatomaceous material containing Bacillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Euglena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

WILL Exchange mounted slides of various crystals, diatoms, in situ, stellate hairs of plants and micio fungi, for other good slides or material. JAMES E. WHITNEY, Rochester, N. Y.

PATHOLOGICAL, Histological and other well mounted slides will be exchanged for mounted specimens of interest. Lists furnished on application. D. E. HAAG, M. D., Liberty Center, Henry County, Ohio.

WOULD like to exchange a 1-6 objective, 160°, adjustable, for a lower power. A. Y. MOORE, 89 Prospect street, Cleveland, Ohio.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossil Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore cases of Fern too numerous to mention, to exchange for well mounted objects. WM. FARNELL, Macon, Ga.

HISTOLOGICAL mounts to exchange for other good slides. T. B. STOWELL, Ph. D., Cortland, N. Y.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

FOR SALE.—Sections of human teeth with pulp in situ, $1.00. F. A. JACOBS, Newark, O.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

FOR SALE,—Slides, double stained, of Bacillus Tuberculosis, 50c. each. DR. W. R, CHITTICK, 83 Lafayette Avenue, Detroit, Mich.

WANTED.—Books treating on microscopical and histological subjects not already in my possession. Will pay cash or give slides in exchange. State name of the work, date of issue, and price. C. H. STOWELL, Ann Arbor, Mich.

WILL Exchange mounts of stained vegetable sections for other mounts of interest. MRS. L. R. LOOMIS, Ann Arbor, Mich.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, AUGUST, 1884. No. 8.
WHOLE NO. 25.

Original Communications.

THE FAKIR'S SECRET.

A. Y. MOORE, M. D., PROFESSOR OF MICROSCOPY, CLEVELAND H. H. COLLEGE.

THERE is probably nothing which the microscopist can show to the average "want-to-see-something observer," which will excite more explosive "Oh, My's!" than a slide of paste eels. Those Microscopists who have occasion to show "something interesting" to their non-microscopical friends, generally reserve the eels for the grand culmination, and even the beauties of the polariscope are eclipsed in interest by this "something alive with plenty of light on it." Vinegar eels are good, but are far too lively and cannot generally be obtained in such great numbers as is the case with paste eels.

We have probably all read the "directions" for raising these eels. Nearly every book treating of the microscope mentions something concerning them; but, after all, the substance is this: Make some flour paste; wait till it sours, and then perhaps you will find eels—and perhaps not. Generally speaking it is perhaps not.

In the December issue of this journal appeared an article by Dr. F. L. James, of St. Louis, entitled "The Fakir and His Little Fakes." This article first suggested to me the idea that there was any *secret* about it. I had seen the "fake" in successful operation many times, and understood it, but supposed the fakirs made paste until the perhaps part turned in their favor.

Some time after reading Dr. James's article, I had a conversation with a fakir. He told me substantially what Dr. James's article did. They procured a little "starter" from the "boss fakir," and kept up their stock by the addition of fresh paste. He had the secret, but would not sell it for less than fifty dollars; and, moreover, he had another "fake" on hand which he hardly dared use, because it was so wonderful that it would attract too great a crowd about his stand! But it was the "secret" which interested me. What *could* it be?

One evening I was looking over an old work on the microscope, when I saw a paragraph giving directions for raising the eels.

It differed from most of these directions by recommending the addition of a few drops of cider vinegar. Evidently that had something to do with the secret, so I resolved to try it. I had a small bottle of the vinegar on my desk; so, the next day, while at the college laboratory, I boiled up some paste. When cool I added a few drops of the vinegar, taking care to get as many eels as possible. The result was even better than I had anticipated. In a few days the paste seemed full of them! This, then, is probably the secret, for it has been successful in each instance in which I have tried it. Cider vinegar almost invariably contains eels, so that it forms a very reliable "starter." It is not necessary that the paste be sour, for the eels seem to thrive as well in fresh paste as in anything else.

Although a specific distinction, in name at least, is generally made between the eels of paste and vinegar, my observations lead me to believe that they are in reality the same, but that the greater nutrient matter in the paste is condustive to a much greater corporeal as well as numerical development. It is stated that they are both oviparous and viviparous, but I have seen no true indications of the former condition, although by

crushing the large females with a compressorium I have in many cases liberated the young and have seen them swim away as though it were a natural birth.

THE FACILITY NOSE-PIECE.

JAS. L. PEASE.

THIS Nose-piece, as usually made, attaches to the stand by the shank which has the "society screw" and is designed as a permanent attachment. When in position it occupies less than half an inch of the working distance.

The rings are made to screw on the shanks of the objectives and may remain permanently attached for they do not interfere with closing the boxes in the usual manner.

There are three steel jaws within the nose-piece that are operated upon by the milled ring that appears on the outer surface. A partial revolution of the milled ring causes the jaws to project inward and engage in the groove on the outer surface of the objective ring and thus the objective is held securely and firmly in position.

With this devise the changing of objectives is accomplished very quickly. The outer surface of the objective ring being perfectly round, (*i. e.* without projecting lugs to enter corresponding depressions in the nose-piece) the objective is not only readily placed in position but an adjustable objective may be placed in the position desired for the best exposure of its markings.

The "grip" of the jaws is sufficient to prevent any adjustable objective from turning in the nose-piece when the collar adjustment is operated.

(The above was written at the request of the editor, in response to the expressed wishes of a number of subscribers.)

STUDIES IN HISTOLOGY.

C. H. STOWELL.

LESSON V.

METALLIC STAINS.

NITRATE OF SILVER.

NITRATE of silver has the property of acting upon the cement substance between the epithelial and endothelial cells, and thus their outlines are accurately mapped out. It

also stains the intercellular substance of cartilage and the cornea. A one per cent. solution is kept in stock, and this is diluted to one-half or one-fourth per cent. when required for use. It should be kept in a dark place, or in a bottle covered completely with black paper.

The tissue to be stained must be as fresh as possible. It is first thoroughly washed in distilled water to remove any chlorides that may be present. It is then placed in a one-half or one-fourth per cent. solution of the staining for five or ten minutes, or until it has a milky or whitish appearance. It is now again thoroughly washed in water, to remove all traces of the silver except that which has been taken up by the cement substance. After exposing this tissue, which has been placed in fresh water, to diffuse daylight it will assume a slightly brown color, owing to the decomposition of the absorbed staining into the black oxide of silver.

A membrane that has been stained by this method will exhibit what are known as "silver lines," a fine black line running between the cells and separating one from another.

After staining with the silver the tissue may be stained with hæmatoxylin and mounted in glycerine or glycerine jelly, only it is necessary that the slide be kept from the light if it be desired to have the preparation retain its first clearness.

CHLORIDE OF GOLD.

A two per cent. solution is made and reduced as occasion requires, to the desired strength. It is kept in a black bottle or in a dark place, like the silver solution.

There are several methods used for demonstrating tissues with gold solutions, as "Conheim's method," "Pritchard's method," etc. They all depend upon some acid, or upon daylight, to reduce the gold. Cole recommends that the tissue be placed in a watch glass and the juice of a fresh lemon squeezed over it, in which the tissue is allowed to remain for five or ten minutes. It is then washed in distilled water, to remove all the juice, and placed in a one-half or one per cent. solution of the gold for thirty minutes. The surplus gold is washed away, and the tissue is placed in a mixture of one part of formic acid and three parts of water for twenty-four hours, in a cool place, and away from the light. The gold chloride will then be re-

duced. This method works especially well for demonstrating the nerves of the cornea, the cornea corpuscles, and the termination of nerves in striated muscles. Gold is principally useful for staining nerve-fibrils and connective tissue corpuscles.

OSMIC ACID.

A one per cent. solution of this is made, and then reduced to a one-fourth or one-half per cent. solution, as required. It has already been referred to as a reagent that blackens fat cells and colors the white substance of Schwann in nerve fibres.

MOUNTING.

It is customary to mount the sections on glass slides three inches long and one inch wide. An effort has been made to change these dimensions; but as this would cause great inconvenience, the usual size should be adhered to, when possible. The slides should be ground on the ends and sides, and should be thin and clear.

The cover glasses are either square or round. As a general rule the round covers are to be preferred. They are much better when the mount is to be placed in a cell, as cells are made round more quickly and evenly by the aid of the turn-table than they can be made square by the unaided hand; and they allow the slide to be neatly finished by running around the cover a little cement. Thin covers should be preferred; at least the thick covers sometimes found in No. 3 ought to be avoided except in special cases.

The glass slides and covers, especially the latter, are generally covered with a dirty oily film that is difficult to remove. They should be placed for a couple of hours in strong sulphuric acid; then removed, and water allowed to flow over them; then placed in alcohol, from which they are removed, one by one, and carefully rubbed clean with a silk handkerchief, or preferably a piece of old soft linen or clean chamois. A strong solution of caustic soda will usually soften any of the hard substances used in mounting. Old slides that have been used for mounting may be cleaned by placing them in this soda solution for a few hours.

Slides and covers should always be thoroughly cleaned as described above, before using.

Thin sections are transferred from one slide or vessel to another by floating, by lifters, and by camel-hair brushes.

Sections are floated in some liquid from one vessel to another, or from one part of a slide to another, without injury, especially when a camel-hair brush is used as a guide.

To transfer with a brush, it is only necessary to dip the brush under the section and raise it out of the liquid. The section will rest over the brush without injuring it in the least. As the brush is lowered in another liquid, the section will float free.

If it is desired to transfer the section from the brush to a dry slide, then the most dependent part of the section is allowed to come in contact with the glass, when the brush is revolved on its long axis away from that part of the section in contact with the slide. After a little practice this will be found to be the most satisfactory method of transferring a section to a slide.

Section lifters are useful in transferring sections from one liquid to another.

If it is desirable to mount the section in some watery medium, it is necessary to have a ring or cell upon the slide. The cell may be made of a variety of things, as glass, wax, etc.

For general work, however, it will be found that white zinc, Brunswick black, and gold size, answer every purpose. The slide is placed upon the turn-table and centered; and with a sable brush a cell is made, a trifle smaller than the diameter of the cover, so that the edge of the cover is in the center of the ring of cement. A number of these cells can be kept on hand, and when one is wanted for use, it is only necessary to apply a little fresh cement to the outer half of the ring, in order that the cover may adhere to it at once. After the specimen has been placed in the cell with the mounting fluid, and the cover applied, another ring is spun around the edge of the cover, in order to seal up the cell.

The reader is referred to Part III. of the work entitled "Microscopical Diagnosis" for a more complete description of the various methods of making cells.

To mount in a cell it is only necessary to use care that the mounting medium just fills the cell. After letting down the cover, if any of the mounting medium overflows, it must be

thoroughly washed off with pure water, and the water removed with blotting paper.

One of the most common mediums used for fluid mounts is slightly acidulated dilute glycerine; this consists of an equal mixture of glycerine and water, to an ounce of which a very few drops of acetic acid are added.

To mount in glycerine jelly it is necessary to melt the jelly in a water-bath. Care should be taken that the jelly is heated only just enough to melt it, any extra heat being prejudical. A drop of the melted jelly is placed on a warm slide with a glass rod. On this drop the section or tissue is placed, and another drop of the jelly placed over it. The cover is lowered upon it and pressed down against the slide more or less firmly, according to the nature of the tissue. When cold, the excess of jelly is easily removed with a knife. It is a good plan to run a ring of zinc around the edge of the jelly as otherwise it is liable to dry and crack. Delicate sections that are easily injured by pressure should not be mounted in this medium, while such tissues as yellow elastic tissue show unusually well in it.

Mounting in balsam is an easy and quick method. Balsam, as a mounting medium, includes any balsam that has been dissolved in any fluid, as balsam and benzole, balsam and chloroform, balsam and absolute alcohol, dammar, etc.

To mount in balsam, the stained tissue is dehydrated by allowing it to remain in absolute alcohol for a few minutes; it is then transferred to the oil of cloves, until it is rendered quite transparent; from the oil it is transferred to the center of the glass slide and a drop of balsam placed over it. Then the cover is applied.

If it is desired to finish these slides with a layer of the zinc cement, it will be necessary to place some medium over the balsam to keep it from mixing with the zinc. This is easily and effectually accomplished by placing around the edge of the mount a thin layer of colorless marine glue; just enough to coat the exposed balsam. This dries very quickly; when dry a thin layer of the white zinc is put on and the mount laid aside for a few days. The second coat of zinc will finish the slide in good shape. The colorless marine glue is dissolved in

fusel oil and is unaffected by benzole, hence it serves as a perfect wall between the benzole of the zinc and the soluble balsam within.

After a little experience in mounting the student will have no trouble with the old bugbear—the formation of air bubbles. One way to avoid their formation is to properly apply the cover.

The cover glass is held between the thumb and forefinger of one hand and applied by its edge near to the margin of the preparation. The cover is held in an inclined manner over the preparation and beneath the overhanging edge is placed the point of a needle. For this purpose the head of a needle should be forced into a small wooden handle, or a crochet needle will answer; while still better are the needles sold by dealers for this and other purposes. By gently lowering the needle the cover will gradually come in contact with the preparation, driving before it a minute wave of the mounting medium in which all air-bubbles are carried off.

A NEW SOLID WATCH-GLASS.

C. H. STOWELL.

WE are indebted to Dr. A. Clifford Mercer for specimens of the Syracuse Solid Watch-Glass, a bath, staining or dissecting dish for the histological laboratory and practical microscopists.

The Syracuse Solid Watch-Glass rests solidly upon the table, or microscope stage, and is not liable to be overturned and its contents spilled.

It is transparent and can be used over black, white or colored paper, enabling the student to use such back-grounds for his work as will permit him to watch its progress to the best advantage.

Transparent tissues can be examined in it from time to time or dissected and studied on the microscope stage, while in water, alcohol, oil of cloves, or other bath, enabling the student to reject unsatisfactory specimens at any step in the process of preparation.

When the top and bottom edges are cut, one watch-glass

rests dust-tight upon another or receives accurately a piece of plate-glass as a cover. In such a watch-glass, covered, specimens may remain for long staining or soaking without loss of fluid by evaporation.

When the concave surfaces are polished, the watch-glass is as clear as a lens and becomes a perfect receptacle for transparent dissecting material on the microscope stage.

The solid watch-glass was first made for the use of the students in the Histological Laboratory, College of Medicine, Syracuse University, where it has proved a most satisfactory addition to the laboratory furniture.

Dr. Mercer now places the dish in the market hoping it will prove equally satisfactory in other laboratories and in the hands of practical microscopists generally.

GLEANINGS FROM THE ROYAL MICROSCOPICAL JOURNAL ON BACTERIA.

C. H. STOWELL.

MICROCOCCI OF PNEUMONIA.—The greater number of these micrococci are surrounded by a more or less broad layer resembling an envelope or capsule, colored light blue or red by gentian-violet or fuchsin respectively, and usually sharply defined externally. Sometimes two or three micrococci are enclosed in the same envelope; but they are never collected together into zoöglœa colonies. These envelopes are soluble in water and dilute alkalies but insoluble in acids. The envelopes are colored by eosin, especially by weak solutions acting for twenty-four hours. These envelopes appear to be *a highly characteristic peculiarity of the micrococci of pneumonia.* They probably belong to the acme of that disease, not being found after the sixth day.

BACTERIA OF THE CATTLE DISTEMPER.—The bacterium of this disease has been supposed to exist only in the bacillus condition. Lately, however, it has been found in the early stage of the disease in the blood and in the lymphatics and spleen, in the form of small round shining bodies or micrococci.

Thus the micrococci and bacilli represent *stages of development of the same organism.*

BACTERIA IN THE MILK OF ANIMALS INFECTED WITH CHARBON. The question has been raised whether the milk of a female in lactation affected with charbon contains the microbium of the infection. Recent experiments show conclusively that *bacteria are found in the milk of animals* infected with charbon while they are still alive; but in much less numbers than in the blood.

MICRO-ORGANISMS IN SOILS.—The superficial layers of the soil are rich in germs of bacteria, particularly in bacilli. Micrococci were only found in places which had not been cleansed from decaying matter. The quantity of micro-organisms diminished very rapidly with increase of depth, and below one metre the soil is comparatively free from them. In one gramme of soil taken .20 metre from the surface it was estimated there were in each of three samples: 700,000, 870,000 and 900,000 organisms. These organisms may have an important function *in the transformation of substances to forms suitable to plant-food.*

BACTERIA ON THE SURFACE OF COINS.—Bacteria and algæ have been found in great abundance in the incrustations and sediments on silver and copper coins, especially old coins that have been in constant use for twenty or thirty years.

Some of the sediment is placed in a drop of water and examined at once. Starch grains and various minute bodies are found.

Two unicellular organisms are so constant that they are considered not as accidentally adherent substances but as *organisms which have their continual origin and seat in the incrustations of coins in currency.* The two new species are: *chroococcus monetarum and pleurococcus monetarum.*

ACTION OF COLD ON MICROBES.—Various organisms, such as bacilli, when subjected to a temperature of 70° C. for 108 hours, and to 130 for 20 hours, are not destroyed; others, such as torula and the vaccine microbe, lost their power of producing fermentation.

A NEW MAILING CASE.

HOWARD N. LYON.

TAKE two slips of wood 3 in. x 1 in. and 1-16 in. thick, in the centre of one make a hole a little larger than the cell Paste a piece of stiff paper on one side of this slip, covering the hole. Lay the slide between the slips and along one side, paste a piece of paper, not touching the glass slide however. A rubber band holds the package tight, and it may be sent as it is or first wrapped in paper. The postage for a single slide is one cent.

If two or more slides are to be sent the modus operandi is the same, except that the openings are alternately on opposite sides. In this case the middle slips need not be covered.

Editorial Department.

HIGH ANGLES OR LOW ANGLES?

We sent two objectives to a young physician who "wanted one that would do the best work for an active physician who had no time to fuss but plenty of time to spend profitably." One objective was a one-fourth of over a hundred degrees aperture and the other was a one fourth of about seventy-five degrees. Our friend returned the one-fourth of one hundred degrees and retained the one of seventy-five. "The one I keep," said he, "has much the better working distance; shows the larger crystals of uric acid better, and defines the smallest oxalates just as well. You do not tell me which you think is the better glass, nor which is worth the more, but for a doctor I am sure I have chosen wisely." But Dr. J. Edwards Smith would tell him, in all probability, that he was not competent to judge, and that after proper education and "eye-training" he would see the error of his ways and would hasten to get a half inch mortar-objective with Butterfield screw.

A LIFE PRESERVATIVE.

We understand that the well-known proprietor of a certain wonderful patent-medicine, made at Rochester, N. Y., is about to issue a circular which he will distribute to the members of the American Society at their first meeting. This circular will state, among other things, that—"if you will take from four to six bottles during the next three or four months it will so fully invigorate the system you will be enabled to prolong your life sufficiently to see a printed copy of your proceedings for 1884."

MR. GRIFFITH'S NEW BOX.

Mr. E. H. Griffith was exhibiting his ingenious microscope one evening to a very attentive listener. He explained one peculiar feature after another with his usual flow of graceful

language. Occasionally he would cast an eye toward his silent auditor only to find him evidently lost in admiration and wonder. Finally Mr. Griffith ventured to ask: "Well, what do you think of it?"

"I think," said the enthusiast, pointing to the morocco-covered case of the microscope, "that is the *handsomest box* I ever saw."

Mr. Griffith is doing as well as could be expected under the circumstances.

A FINE COMPLIMENT.

Our elder brother Prof. T. B. Stowell, A. M., Ph. D., has just declined two very flattering offers. He was elected Prof. of Biology in a large University, and also principal of one of the largest State Normal Schools in the country. Although the salary in the latter case was most flattering and tempting, such as few receive, yet he decides to continue in his chosen work at the Cortland State Normal School, as Prof. of the Natural Sciences.

A NEW MICROSCOPICAL JOURNAL.

We are in receipt of a new quarterly journal—"Zeitschrift fur wissenschaftliche Mikroskopie und fur mikroskopische Technik," published at Brunswick, and edited by Drs. L. Dippel, M. Flesch, A. Wichmann, and W. J. Behrens. It embraces "Microscopy" in its widest sense, and includes original articles, abstracts and reviews, and a bibliography of microscopical literature. Those interested in the matter can address Dr. Behrens, at Göttinger, Germany.

We are in receipt of a number of photo-micrographs of diatoms, of the broken shell series, by President T. D. Cox, of Cincinnati. Pres. Cox used for these a Wales 1-15 objective, magnifying from 700 to 1800 diameters.

Selections.

SPONGE.

The material known in commerce as sponge is obtained by divers from the sea bottom in the neighborhood of the Greek Archipelago, the Bahamas, and other parts of the world, but it is not the whole animal but only a supporting skeleton from which all the living matter has been removed by washing, squeezing, and bleaching in the sun. If a piece of this sponge be examined with the naked eye there will be seen numerous large, more or less circular openings leading into canals which branch and penetrate the sponge in all parts and freely communicate with one another. A simple lens of high power will show that the substance of this skeleton is composed of an open feltwork of curling and branching fibres of a horny substance called *keratode* (Gr. *keras*, horn; *eidos*, form). In a living sponge this cannot be made out, for the skeleton is then covered with a slimy material and only the larger openings are then visible. Sections of the living sponge in any direction would show that this same slimy substance pervaded the whole interior, covering all the fibres and lamellæ and leaving only a series of narrow, branched canals, the smaller branches of which communicated with a number of microscopic openings called "pores" in the outside of this gelatinous mass.

If a healthy sponge be examined in some of its native water, to which some finely-divided solid substance—say carmine—has been added, it may be observed that currents of water are constantly flowing into these pores, while other currents are streaming away from the larger apertures, called *oscula* (Lat. dim. of *os*, mouth). It is thus evident that there is a constant circulation of water entering the sponge by the smaller pores or *inhalent* apertures, traversing the various channels in the substance of the sponge, and emerging from the larger oscula or *exhalent* apertures.

Sections of fresh sponge display the fact that the slimy substance—the so-called *sponge flesh*—consists of an assemblage of nucleated corpuscles or *sarcoids*, about $\frac{1}{2000}$ or $\frac{1}{3000}$ of

an inch in diameter, and of irregular and inconstant form. Each consists of a speck of colorless protoplasm, the semi-fluid granular interior of which—the *endosarc* pass into a firmer clear outer layer—the *ectosarc*. In the endosarc, besides the nucleus there is sometimes a little cavity—*contractile vesicle*—endowed with the power of rhythmic dilation and contraction. The sarcoid has the power of changing its form by the protrusion of blunt processes—from any part of its body, and when free from the mass it can crawl about by the same means. It bears, in fact, a remarkably close resemblance to an Amœba. In various parts of the canals, especially near the surface of the sponge, there are found round or oval chambers, lined with a layer of sarcoids, which present some advance in structure on the amœbiform type. Their form is usually columnar or oval, they possess nuclei and contractile vesicles, and their outer layer frequently assumes the character of a distinct limiting membrane. Each possesses a long *flagellum* (Lat. for whip), which it is capable of lashing backwards. In many forms the limiting membrane is raised up round the base of the flagellum into a membranous collar, and the sarcoid very closely resembles certain collared infusoria. Occasionally very peculiar forms are met with, where the flagellum and collar are borne at the end of a long neck. We can now understand that the currents which traverse the sponge are caused by the co-ordinated lashing in one direction of the flagella in these *ciliated chambers*, as they are called. But how is this co-ordination brought about? We do not know. It is one of the mysteries of protozoic life. Generally on the outside of the sponge, and less constantly in various parts of the interior, masses of nucleated protoplasm occur, which present a variation from the amœbal type in the opposite direction to that taken by the flagellated sarcoids, which we have seen is one of elaboration and specialisation. The masses in question present a degradation of structure, for the sarcoids of which they originally consisted have lost all their individuality, and fused into a continuous film, or *syncytium*, as Haeckel calls it, and all that remains to mark their presence is their nuclei, but the mass still retains its functional activity.—*Cole's Studies.*

THE AMERICAN HOG—HIS INSPECTION A NECESSITY; OR, TRICHINA AND PUBLIC HEALTH.

BY T. B. REDDING, A. M., PH. D., F. R. M. S.

In 1881 I examined twenty hogs and found trichinæ in two, one of them exceedingly full; in 1882 I examined twenty-five and found but one that contained any of the parasites. Last year I examined, at various times during the year, fifteen, and found one that contained trichinæ; these were hogs that had been killed and were sold on our market. I also, during the past winter, examined the muscles of three hogs that had died and were left on the street a few days, and found trichinæ in each of them in great abundance; they were fed in very dirty pens and where rats greatly abounded.

These parasites have been found in the flesh of man, the hog, the cats, rats, mice, the hippopotamus and other animals. Two or three years ago, while examining a piece of one of the pectoral muscles of a frog, which had been caught in the branch that carries away the water of our pork-house, I discovered it full of trichinæ. I believe this is the first instance where the parasite has been discovered in the frog. The hippopotamus had been fed offal at the zoological gardens of New York, and doubtless contracted the parasite in that manner.

Two years ago a cat, living at my barn, had five kittens. When the kittens were about eight weeks old the mother sickened and died; about the same time the kittens also became sick, and one after another died. I examined pieces of the muscles of the mother and each of the kittens, as they died, and in all I found vast multitudes of encysted and encysting trichinæ, and great numbers of free trichinæ in the stomach and intestines. A short time before the mother-cat sickened, I found her and her kittens making a meal off a large rat which she had killed, and which was probably the source of infection.

Recently I received a small piece of human muscle, from Dr. C. H. Stowell, of the Michigan State University, and editor of the "Microscope," at Ann Arbor, which is very full of parasites. I have a specimen of it here, mounted, ready for examination under the microscope, which contains thirteen encysted trichinæ. If the person from whom this muscle was taken was

a medium-sized person, and all parts of the voluntary muscles were as full as this, he, or she, must have furnished a home for at least sixty to eighty millions of the parasites.

From all the information derived from my own experience and examinations, and those of others, I am of the opinion that the number of our hogs infected will vary from two to eight per cent. on an average; that in badly-kept piggeries and lots, in the presence of rats and other vermin, the per cent. is largely increased; but where hogs are kept in large, clean places, away from buildings and rats, and where they are not permitted to eat those that die, trichinæ will seldom be found.

Extract from paper read at the Sanitary Convention, held at Anderson, Ind., April 24th, 1884.

THE GERM ORIGIN OF DISEASE.

The following is a portion of an article by Dr. W. S. Newton, in the Peoria Medical Monthly:

When a disease has a germ origin it presents to us in its course some of the traits or phenomena of organic life, animal or floral.

Let us name a few of those phenomena and then apply them to our common diseases:

1st. Animals and plants are so nearly similar that what fact will apply to one applies to the other also. An egg of an animal and a seed of a plant are similar structures and the beginning of all organic life. After life is originated in many cases it may be propagated by buds. To start life from seeds and eggs they must be submitted to either germination or incubation and consequent fermentation.

2nd. Germination or incubation puts in motion a force called fermentation or zymosis. No organic body can decay and rot without fermentation. Flesh, fruit and all organic bodies would never decay if millions of germs did not incubate in every fibre and atom and set up fermentation and consequent decay.

The tooth of oxygen may eat iron and nearly all metals without germ life, but when organic bodies decay incubation or germination starts the process. In some countries meat is ele-

vated in the air above germ life and this saves it from putrefaction even when the days are hot. Fruit is sealed in cans not to keep out air but germ life. *In any disease then where there is putrefaction and fermentation or zymosis there is abundant germ life for a cause.*

3rd. There are floral and zoological zones around the earth running with the equator or parallels, and each zone has its peculiar flora and fauna. If the elephant and other phenomenal animals and plants live in such zones, microscopic animals and plants causing disease will do so also.

4th. Some plants and animals flourish in certain regions—in swamps, in valleys dark and cold—and some are marine or aquatic and some inhabit sandy plains. When germs of this kind cause disease we call the malady endemic.

5th. Animals can travel with the wind and against it. Plants are carried by streams and the wind and by animals, and never against the wind.

6th. Plants grow in the warm days of summer, rest in winter and with the spring revive again. Insects also live in the summer.

7th. Animals may be entozoal and live in the dark, true parasites, but plants cannot flourish in the dark. Wood and Gray both say plants must have light for healthy growth. When plants cause disease we must suppose they grow on the surface of the body in the light. Animal germs may live anywhere in the body in the dark and in the light.

8th. Animals and plants are not attacked by parasites when in perfect health like when they are sickly and weak.

9th. Certain agents destroy organic life when applied to it. We call these agents antiseptics.

Let us now try some of our common diseases by these traits or forms of organic life and see whether we can find any similarity.

Typhus and Typhoid Fevers, have plantings and growings. Zymotic, zoological zone for former. Antiseptics influence them.

Small-Pox, Scarlatina, Measles and other eruptions—Planting and hatching, travel against the wind, zymotic zones for some of them. Antiseptic influence.

Whooping Cough and Mumps—Planted and incubation, travel against the wind. Spread by germs.

Ague and Intermittent Fever—Planted and germinate. Travel from swamps with wind, flourish in the summer, rest in the winter, start up to life in the spring. Ansiseptics influence.

Goitre—Endemic to mountain valleys; affect the weak; is influenced by antiseptics.

Consumption and Scrofula—Seem to grow after planting; afflict the weak; have a zone; affected by antiseptics; grow in the dark; seem to be animal germs causing them.

Cancer and Lupus—Incubated and grow to maturity; may be planted; seems to spread by budding like protozoans.

Gonorrhœa and Syphilis—Planted seem to incubate and at maturity bear seeds or eggs; affected by antiseptics.

Leprosy and Skin Diseases—Grow in the light; afflict the weak; spread to planting.

Hydrophobia, Snake Bite and Skunk Bite—Grow by planting; seem to be affected by antiseptics; zymotic.

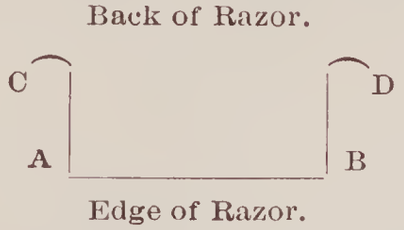
Rheumatism—Flourishes in damp weather; influenced by antiseptics. Said to be zymotic.

Yellow-Fever—Has a zone; flourishes in warm weather like the plants and hexapods.

Erysipelas, Influenza, Puerperal Fever, Typhoid Pneumonia and Putrid Sore Throat—Spread by planting; affected by antiseptics; zymotic.

FRANCOTTE'S SECTION-FLATTENER.

P. Francotte describes a simple apparatus made by bending an iron wire or knitting needle 1 mm. in diameter into two right angles, the points A and B being 7 to 8 cm. apart.



The arms A C and B D are bent into hooks, so as to attach the apparatus to the back of the razor. A C and B D should be of such a length that A B is 0.1 or 0.2 mm. behind the edge.

In cutting, the sections are partially rolled round A B. It is then easy to transfer them to a glass slide, and to make them flat, which is generally done without difficulty.—*Royal Microscopical Journal.*

Reviews.

A PALACE-PRISON; OR, THE PAST AND THE PRESENT. 1884. 16mo. Cloth. $1.00. New York: Fords, Howard & Hulbert.

It is difficult to form a correct opinion of a work like this. There are some things in it so overdrawn and exceptional that the medical critic gets out of patience and wholly provoked at the author for writing such a work; while, on the other hand, there are some such wholesome criticisms and wise suggestions on the present method of treating the insane, that the reader finds himself thoroughly awakened to the wrongs committed "in these herding-places."

The book pretends to be a true representation of the interior life of a large insane asylum, or "palace-prison," as the author calls it.

The author states that all "the seemingly incredible incidents of the narrative" are within his personal knowledge, and must therefore be facts. That there is terrible injustice done in some of our asylums cannot be denied, but when the author asks if any patients are ever dismissed "unless by the direct order of those who pay for keeping them there," he goes too far.

The whole thrilling story of the charming girl Marion is one calculated to excite the deepest interest, especially as we are told that "she did, and does, exist."

It is a vivid picture of a continual series of the most terrible wrongs it is possible to imagine to occur among the dread mysteries of an insane asylum. The book, if generally read, will certainly fulfill one of the desires of the author—"a tendency to depopulate asylums." It is a "peculiar" and a strong work.

THE WHITE MOUNTAINS. A Handbook for Travelers. pp. 436. 6 maps and 6 panoramas. Fifth edition, revised and enlarged. $1.00. Jas. R. Osgood & Co. Boston, 1884.

This book furnishes a complete guide to the peaks, passes, and ravines of the White Mountains. It is also a guide to all the neighboring cities and villages, hotels and boarding places. If you intend to go to New Hampshire, Western Maine, or the upper Connecticut Valley, you should have this book for a com-

panion. We have consulted it daily, we might say hourly, and it has added much to the profit of our trip.

A COUNTRY DOCTOR. By Sarah Orne Jewett. Second edition. 1884. 16mo. $1.25. Houghton, Mifflin & Co., Boston.

Miss Jewett is well known as a very pleasing writer of short stories of our best literature. She gives us her first novel in the story of a doctor's life. She must be the daughter of a medical man herself, such close familiarity does she show with all the incidents of a professional life. Miss Jewett is a close observer, and this with a certain easy, graceful style makes her book a very interesting one for a summer-day's reading. Her character sketches are so perfect that the members of all the doctor's household will delight to see themselves so well portrayed before the public.

THE ORIGIN OF SPECIES. By Charles Darwin. In two double numbers of the "Humboldt Library of Science." Price, 30 cents. J. Fitzgerald, publisher, 20 Lafayette Place, New York.

The principles developed by Darwin as the result of his famous researches are found only in the study of his immortal work, "The Origin of Species," which is now for the first time published at a price which brings it within the reach of all.

OUR ADVERTISERS.

Reed and Carnrick present their well-known preparations of Malt and Beef Peptonoids.

An analysis by Dr. Prescott, of the University, of their Maltine shows that it will convert 33 times its weight of starch, while the same preparation by the Trommer Co. converts less than half that amount. All our medical readers must be interested in the analysis of their Peptonoids, by Dr. Stutzer, of Bonn. Dr. Stutzer shows that there is more nourishment in a quarter of a pound of good steak than in half a gallon of beef tea made in the regular way. He then shows that 70 per cent. of the peptonoids consists of nitrogenous nutritive material. The conclusion follows that "there is no food preparation that compares with it in nutritive properties."

Particular attention is called to the new advertisement of Prof. Sexton, announcing that he has sold his entire stock of Gundlach's goods to Bausch and Lomb. It is hoped that Mr. Gundlach will continue the manufacture of his excellent objectives and that somebody like Mr. Sexton will handle them.

Mr. Bachrach and Bro., are offering some of the new embedding material, "celloidine." Being transparent, indestructible, and non-shrinking it forms a most valuable medium for embedding small pieces of tissue of any kind. It is highly recommended for photo-micrography being free from sediment and highly sensitive.

AT THE DOCTOR'S EXPENSE.

Young physician—"No, it is not in good taste for a young physician when writing to a patient to sign himself, "Yours till death."

A local paper, in giving the usual graphic account of an accident which befell a hod-carrier, wound up by stating that

"Dr. B. was called in, but no disastrous results has followed up to the time of our going to press."

"I called to thank you, doctor, for the medicine I got of you last week," said an elated young man to a pompous quack. "Ah, indeed; I was sure it would help you. How much of it did you find it necessary to take to effect a cure?" "Oh, I didn't take any of it myself. It was for my uncle. He died two days after he commenced taking it, and I am his legatee."

An inopportune dislocation of the jaw is one of the topics dealt with by a *feuilletoniste* writing in a recent issue of the *Union Medicale*. It seems that during a performance of a wedding ceremony the bride sneezed so violently as to dislocate her jaw at the critical moment when she should have pronounced the solemn "oui." As she was unable to articulate the word, it was found necessary for the whole party to repair to a surgeon before the ceremoney could be completed.

Yesterday a doctor hitched his horse on Adams avenue while he made a call at a Woodward avenue drug store. As he was concluding his errand there a boy about 9 years old came in and said:

"Doctor, your horse is awfully skeered of fire-crackers."

"Well, I don't know."

"Oh, I'm sure of it!"

"How can you tell?"

"Why, I threw one under his feet and he broke the strap and ran away!"

Dr. Formad, of Philadelphia, says:

1. The bacillus of Koch is a valuable diagnostic sign of tubercular disease.

2. Nothing is proved by its discovery for the etiology of tuberculosis.

3. The too ready acceptance of the bacillus doctrine is not justifiable, and is likely to do more harm than good.

4. Neither phthisis nor any form of tuberculosis is contagious.

Items.

BISHOP POTTER NOTICES "ROSY PLUMES."

A full account of commencement exercises appeared in the Commercial Gazette, of Cincinnati. Speaking of Bishop Potter's reply to the toast at the alumni dinner the correspondent says: "He made, in conclusion, a strong plea for the teaching in school of the handicrafts and complimented the University in having demonstrated the fact that women may receive a classical education and not be defeminized in matter of appearance; that a woman may be learned in medicine and science and still possess a soul touched to the finer issues of dress and (with a graceful gesture to that section of the hall where Mrs. Prof. Stowell, of the faculty, sat with a group of friends, her handsome head crowned by a cluster of rosy plumes) be even a university professor and yet not disdain a feather."—*Ann Arbor Register.*

"The ladies of the graduating classes of the University petitioned Mrs. Stowell, of the literary faculty, to represent them on commencement day by occupying a seat on the platform with the members of the faculties, the regents, the speaker of the day, etc. Mrs. Stowell, however, modestly declined the proffered compliment."—*Ann Arbor Courier.*

M. Pasteur has been furnished with an opportunity of testing his theories concerning rabies upon a human subject. One of the servants of the Paris and Lyon Railway at Tarascon-sur-Rhone, having been bitten by an undoubtedly mad dog, has just placed himself in the hands of the illustrious savant.

In a short preliminary note in the *Vratch*, Prof. N. V. Sorokin, of Kazan, states that he has discovered a new polymorphic micro-organism, which is invariably met in cases of follicular tonsillitis. The author proposes to name this micro-organism, leptothrix anginæ.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, SEPTEMBER, 1884. No. 9.
WHOLE No. 26.

Original Communications.

PROCEEDINGS OF THE AMERICAN SOCIETY OF MICROSCOPISTS

THE annual meeting of the American Society of Microscopists was commenced in the Hall of the Free Academy, at Rochester, N. Y., on the afternoon of the 19th of August. On the platform were seated Hon. Jacob D. Cox, of Cincinnati, President of the Society; H. F. Atwood, President of the Academy of Science; Mayor Parsons and Rev. Dr. Landsberg. H. F. Atwood gave the address of welcome, and was followed by an address from the mayor of the city. Rev. Dr. Landsberg offered the following prayer: "Heavenly Father, source of all life and light and wisdom, whose greatness no human mind can compass, and whose love no human heart can fathom, whom the heavens and the heaven of heavens do not contain, with deep gratitude and peculiar devotion do we meet this day in thy universal church, which is not confined by sectarian boundaries, but is broad as the universe thou hast called into existence, whose only dogma is the duty to search for the truth, and which includes all those who seek thee in thy works. We thank thee, our Father, that thou hast brought together from all

sections of our beloved country this beautiful gathering of priests in the temple of science, men whose occupation is so peculiarly calculated to call back the wandering intellect to religious emotions, and to proclaim to the astonished eye the secret workings of an omnipotent creator; men whose investigations preach with overwhelming eloquence that even in the smallest and most minute manifestations of creative power looms up the glory of an all-wise governor. We thank thee for this unity and sacredness in science which makes the student rise from it hallowed and elevated. We thank thee that it so powerfully engages the present century, and by its ideal majesty and continuous revelation of ever new miracles counteracts that low and narrow materialism which threatens to bury all the sublimest aspirations of our divine nature in the common gulf of selfishness and worldliness, and which prompts man, the feeble tenant of an hour, to regard himself in the pride of his property or the vanity of his knowledge as the master of creation. We thank thee that the scientific spirit of the age sheds bright light into the haunts of prejudice, drives out superstition, and though showing the futility of many beliefs which seemed to be as firmly established as the foundations of the earth, tends to fortify true religion by leading men closer together, and by teaching them more and more forcibly that in spite of outward differences they are all brethren, children of the same loving Father. With a particular sense of our joy do we express our gratitude, Heavenly Father, that our beloved city has the honor and the privilege of greeting as guests so many distinguished visitors and eminent investigators of thy works, every one of them a minister who teaches thy truth. Grant that this assembly may exercise a lasting influence on our fellow-citizens, and animate them to ever greater efforts in reaching and interpreting thy revelations in the glorious book of nature. Grant that this society may continually grow and increase in usefulness. Grant that the spirit of peace and brotherly love may preside over the deliberations of this body, and crown with success all those who work for their own instruction and for the enlightenment of their fellow-men. Send thy blessings upon our proceedings, that thy spirit may rest upon all who participate in them, the spirit of wisdom and

understanding, the spirit of counsel and might, the spirit of knowledge and the fear of the Lord. Amen."

REMARKS OF DR. DALLINGER.

PRESIDENT COX announced that Dr. Dallinger and A. W. Bennet, of the Royal Microscopical Society of London, were present as representatives of that society. Upon invitation the two gentlemen took seats upon the platform. Dr. Dallinger made a short address, in the course of which he said that it was a matter of great interest to him to be present at the meeting. As the representative of the London society he desired to express his lively appreciation of the work being done by the American organization. That which linked the two societies together was the fact that both were laboring in the interest of humanity. The speaker referred to the fact that light had been thrown on the causes of disease by the researches of microscopists. The microscopists were grappling with the source of diseases and were endeavoring to rid society of its deadliest evils. In conclusion, the speaker said he presented most cordial greetings to the society, and said the English organization had the heartiest interest in the former's work.

Mr. Bennett was introduced and referred to the vast amount of work being done by the American society. He also emphasized the benefits to be derived from a society devoted to practical study and use of the microscope.

MORPHOLOGY OF RHEUMATIC BLOOD.

BY DR. EPHRAIM CUTTER.

DR. GEORGE A. BLACKHAM read a paper on the "Morphology of Rheumatic Blood," written by Dr. Ephraim Cutter, of New York, who was unable to be present. This paper dealt with the peculiar microscopical appearances presented by the blood of rheumatic patients. The abnormal appearances were mainly the presence of strings and tangled masses of fibrin, crystals of cystine, oxalate of lime, phosphates, uric

acid, hippuric acid, etc. The presence of these materials in the blood gave rise to pain and swelling by interrupting the equable flow of blood through the vessels. Sometimes large collections of these snarled threads of fibrin entirely blocked some larger vessel and produced death. The value of the microscope was shown in two ways: Aiding in diagnosis, and by pointing out the exact conditions by which a course of treatment would most likely be of use.

FUNGI FOUND IN SEWERAGE EFFLUENTS.

BY A. W. BENNETT.

A. W. BENNETT, the distinguished London botanist, read a very valuable paper on "Fungi Found in Sewage Effluents." In the introduction he stated that he had been engaged in examining under the microscope the vegetable organisms in the effluent water for the purification of sewage. One important organism found is what is called "sewage fungus." It forms dense flaccolent grayish white masses attached to the bottom or side of the channel, or to ordinary green algæ. The microscope shows it to be composed of an immense quantity of colorless threads, with but little or no chlorophyll, full of granular protoplasm, and containing a number of bright, strongly refractive globular particles. The views of different authors concerning the sewage fungus were given. His closing sentences were as follows:

"It appears, therefore, to have the power of extracting sulphur, not only from decomposing organic matter, but also from the mineral sulphates dissolved in spring water. Sulphur may be set free in this way by the mutual decomposition of soluble sulphides and sulphites. Independently of the source of sulphur is the organic matter present in the sewage itself. There is an abundant supply of this element in the substances used for purifying or precipitating the sewage, which are usually sulphate of alumina, lime and photo-phosphate of iron. The growth of the so-called "sewage fungus" must undoubtedly, therefore, be regarded as evidence of the presence in the water of an abnormal amount of sulphates, derived either directly from sewage or the substances used in precipitating it,

or in other ways in manufactories. But there seems to be no reason to believe that it will itself have any injurious effects on the water. It is difficult to see how the sulphur once set free, can again combine with hydrogen to form sulphuretted hydrogen gas, as long as the organism is growing in the water. Indeed, if allowed to accumulate and periodically removed, it may tend to purify the water by abstracting from it some of the undue proportion of sulphur."

The paper was discussed by Dr. Dallinger and Professor Lattimore.

HAIR, MEDICO-LEGALLY CONSIDERED.

DR. WM. J. LEWIS.

WM. J. LEWIS, of Hartford, read the following paper on "Hair, Microscopically Examined and Medico-legally Considered."

The importance of closely inspecting weapons, and of carefully examining hair found upon them, may best be shown by a few illustrative cases. In a case quoted by Dr. Taylor, a hatchet, having clotted blood and hair adherent to it, was produced as evidence against an accused person, under whose bed the weapon had been found. This, with other circumstantial evidence, had turned public opinion strongly against the prisoner; but when the hair was examined it was found not to be human, but to have been taken from the body of some animal. This circumstance led to a more complete sifting of the evidence, and the prisoner was acquitted. It turned out that the prisoner had killed an animal with the hatchet, and had carelessly thrown the weapon under his bed. (Taylor's Med. Jurisp. Vol. I., p. 508.) Some years since a little girl was murdered in one of our large cities, and the appearance of wounds which had been inflicted upon her head indicated that the weapon used was some blunt instrument. A club stained with blood was found near by. The counsel for the accused person endeavored to show that the club had been used by the prisoner for the purpose of killing pigeons. The club was submitted to examination, and there was found in the clots thereon and in the splintered portions of the weapon, certain hairs which were

identified by others and myself as fine hairs from a human head. By comparison, they were in every respect precisely like hairs taken from the head of deceased. In the case of an alleged murder in Connecticut, where the charred bodies of two women had been found in the debris of their dwelling which had burned to the ground, I was employed by the state to make an examination of certain pieces of half burned cloth, some partly singed hair, and numerous other fragmentary substances. I found considerable blood in unburned portions of the cloth, but owing to the high temperature to which it had been exposed, the corpuscles could not be sufficiently restored to determine, even approximately by the aid of micrometry, whether they were human or animal origin, and it was not known whether there was an animal in the house at the time of the fire, or not. I found, however, some hair which had been matted together by blood previous to its being heated, and was able in that case to show that the hair was from the head of an adult dark-complexioned person.

Quite recently I examined a knife which was supposed to have been used by an accused person as the weapon in an alleged murder. On its blade were stains resembling dried blood, and in one of these stains were a number of hair-like filaments, which, under an ordinary pocket magnifier, closely resembled soft, downy human hair. Further examination showed them to be cotton.

In cases of forensic microscopy the importance of a careful examination of all minute fibers found upon weapons cannot be too strongly insisted upon. A case is related where a razor was found which belonged to a prisoner, on which were some small fibers imbedded in blood, which, examined under a high magnifying power, proved to be cotton. In cutting the throat of his victim, the murderer has also cut through the cotton strings of her nightcap. The similarity of the cotton fibers on the razor belonging to the prisoner and those of the strings on the deceased woman's nightcap was fully established. (Tidy's Legal Med., vol. I, p. 572.)

In another case, a knife which had been used to inflict a fatal wound, and which had been wiped afterward, contained in its depressions and irregularities, as well as between the

layers of the handles, coagula of recent blood mixed with rust. One remarkable circumstance brought out by the microscope appeared to connect the weapon with the prisoner. In a small coagulum found on the knife, dried and fixed to the blade, were some woolen fibers of a peculiar purple brown dye. These corresponded exactly to the fibers of the woolen jacket which the prisoner wore.

With these remarks we may now inquire into the characteristic distinctions which exist between human hair and animal hair. For the purpose of convenience they may be considered under the following heads, viz: First, The relative proportions of the cortical and medullary structure. Second, The size, shape and arrangement of the medullary cells. Third, The size, shape and arrangement of the superficial cortical cells. Fourth, The size and shape of the hair shaft. First, the relative proportion of the cortical and medullary structures. In animals, the medulla almost always forms a much larger proportion of the hair shaft than in man, though there are a number of exceptions to this general rule. In hair from certain quadrumana, the monkey for example, the relative proportion of medulla is about the same as in the hair from man, though its appearance is different. The stronger and denser the hair, the greater is the thickness of cortical structure, while conversely the lighter, more pliable and spongy the hair the greater is the proportion of the medulla. This rule is well illustrated in such typical examples as the pig's bristle, intended more for protection than warmth, with its hard, horny cortex and proportionately small medulla, and on the other hand the soft, pliable though coarse hair of the deer, with its thin, delicate cortex and full spongy medulla, evidently constructed as much for warmth as protection from violence. So universal is this rule that, with a full knowledge of the life history of a given animal, we can form an opinion as to the relative proportion of cortical and medullary structures with considerable accuracy, even before we have made a microscopic observation. Second, size, shape and arrangement of medullary cells. In human hair we find the medullary cells of variable size, irregularly round, that is, in such diverse shapes as globular cells assume when in close and crowded aggregations. They differ in gen-

eral appearance from the corresponding cells in most hairs of animal origin. They are smaller, more crowded, and unless specially prepared, less distinct than the medullary cells in animal hairs of the same diameter. In hair from most of our domestic animals we find the size, shape and arrangement of these cells to be so totally unlike those in human hair, as to be contradistinguished at a glance when properly mounted and viewed under a good glass by transmitted light. In the rodentia, for example, these cells are mostly arranged in pretty regular longitudinal lines, the medulla in the finest hairs being composed of but a single row of more or less distinctly separated cells. Third, the size, shape and arrangement of the superficial cortical cells. In human hair these are thin, flat and usually fusiform, superimposed flatly, one on another, and overlapping so as to give the appearance of very fine irregular transverse striæ on the surface of the hair, and a delicate serrated edge on the outer borders. The projection of these superficial cortical cells is only equal to the thickness of a single cell. On the other hand, in animal hair, where the cortex at all resembles that of human, the striæ are coaser, more distinct, the lines more widely separated and the edges generally more deeply serrated. In many hairs the projection of the superficial cortical cells is so great that instead of the striated appearance, we have a rough surface thickly studded with obliquely projecting points or spurs; or we may find the scales arranged in handsome whorls at regular intervals as in the hairs of some bats. Fourth, the size and shape of the hair shaft. Hairs from different parts of the same person or animal vary in size. So also do hairs from the same animal, when collected at different seasons of the year, vary considerably both in length and thickness. As a means of identity the diameter of the human hair is important when considered in connection with a considerable number of measurements made from hairs from a known source. Measurements taken of the diameter of a hair for the purpose of ascertaining whether it is of human or animal origin, are of little or no use, but measurements made of the thickness of the cortex and diameter of the medulla whereby the relative proportion of each may be obtained, are of considerable value.

In conclusion I wish to say that by following the general line of investigation indicated in this paper we are able to distinguish human from animal hair.

THE PRESIDENT'S ADDRESS.

IN the evening, Ex-Governor Cox, president of the society, delivered his annual address in the city hall. The speaker was introduced by Professor S. A. Lattimore, of the University of Rochester. The address was in one sense a memorial of one of the most distinguished members of the society, Robert B. Tolles, one of the pioneers in the introduction of modern wide angled lenses, and in whose death, which occurred within the last year, the scientific world sustained a great, almost an irreparable loss. The speaker gave a historical sketch of the great debate over the practicability of enlarging the aperture of microscope objectives beyond the maximum angle in air in which Tolles' part was by common consent the leading one practically. President Cox endeavored to show by a careful review of the discussion that Tolles deserved to rank high in it for clear and accurate scientific comprehension of the principles to be applied, and that he had passed beyond the field of the skillful artisan into that of a systematic and able investigator who worked toward valuable results by the proper application of well understood laws. It was evident that the address embodied the results of a vast deal of study and research. It will constitute a valuable contribution to the records of the society which have not hitherto contained a connected account of the controversy which resulted in the triumph of very important improvements in the microscope, which had their origin and their first conclusive theoretic demonstration in this country. The address occupied an hour and a half in its delivery. It was listened to throughout with the closest attention, and at its conclusion the speaker was warmly applauded.

We are in receipt of two fine engravings of "Eminent Men" and "Eminent Women," from The Travelers' Insurance Company, through their consulting surgeon, Dr. Wm. J. Lewis.

MEMOIR OF ROBERT B. TOLLES.

BY DR. GEO. E. BLACKHAM.

DR. GEORGE E. BLACKHAM was the next speaker. His subject was "Memoir of Robert B. Tolles." "He was a man of very retiring disposition, making the obtaining of facts for the memoir exceedingly difficult. A sister of the deceased, now living in Chicago, had been found to be the principal source of information concerning the life of Mr. Tolles. It was a touching narrative of genius struggling with poverty and ill health and ultimate success. He was born at Winchester, Litchfield county, Connecticut, and was the second of five children. His early days were spent on the farm and his early education was very much neglected. At the age of 18 he suffered from a very severe attack of pleurisy, from which he never recovered. His father was an inventor who died in Cincinnati in 1848. His mother died in 1841, soon after which he walked to the house of an uncle living near Rochester. On the way home he stopped at Canastota and became an apprentice to Mr. Spencer. In 1858 he established a place for himself in a loft. In 1867 he became superintendent of the Boston Optical Works, and later the whole management of the works was placed in his hands. In 1873 he made a step which placed him at the head of his profession by inventing a three system lens. He invented many other improvements which did more for microscopy than the inventions of any other man at the time. He was tall, thin and slight, with a long full beard and brown hair. He was painfully shy and reserved. His life was a long struggle with poverty and disease, but he had an indomitable will that kept him in the workshop, where he was content to remain so long as he could do good work. During his last illness he had a microscope brought to his death-bed, where he made examinations of lenses. He could get rest only by sitting in a chair, for many years. He died November 17, 1883, at Boston, where he had worn himself out with work and devotion to his business. His funeral was largely attended by scientific friends and his body lies in the beautiful Mt. Auburn cemetery. His brother-in-law will erect a monument, but the most enduring monument to his genius are the splendid lenses he has left as the result of his

genius and untiring ambition. To great theoretical and practical knowledge of the science of optics, he united mechanical and inventive genius and marvelous skill of eye and hand. While still in the service of Mr. Spencer he devised the form of cover correction for objectives, in which back and middle combinations have a rectilinear motion only, and the front remains entirely stationary. In 1853 he invented and patented his solid eye piece. In 1858 he made his first immersion objectives, though of course, this plan was not original with him. In 1858 he constructed objectives with two fronts, one to be as an immersion and the other dry. In August, 1873, he made the great step forward which placed him at the head of his profession, the Columbus of a new era of microscopy. He made an immersion one-tenth with an aperture greater than that corresponding to infinitely near 180 degrees in air. It was a three-system lens and had an aperture of more than 110 degrees in balsam or 1.25 N. A. The same month he made his first lens of the duplex front formula one-fifth glycerine immersion of 110 degrees balsam angle. Both passed into the possession of the Army Medical Museum at Washington, and both were practically homogenous immersion lenses, as they gave the very best results when immersed in soft balsam, which had been brought as nearly as possible to the same index of refraction as the crown glass of which their front lenses were made viz. 1.525. The importance of this bold step and its influence upon the progress of microscopy can scarcely be estimated at this time, but it is certain that it was the cause of a revolution of opinion and practice among users and makers of microscopes all over the world.

Mr. Tolles was the inventor of many other devices and appliances for the microscope. In 1866 he invented and patented his stereosopic binocular eye piece; in 1878 he received two patents for improvements in the microscope stand. For years his stands were models of elegance, convenience and stability, and his mechanical stages are, I believe, unequalled to-day for delicacy of construction and perfection of working. In addition to his work on the microscope he made some telescopes remarkable for their short focal length in proportion to the diameter of object glass and for their remarkable defining and penetrating power, a small instrument with an objective only one inch in

diameter, easily carried in the pocket, being fully equal to a good instrument of two and a half inch objective and three feet focus.

Professor William A. Rogers, who was personally acquainted with Mr. Tolles made a brief andress, in which he alluded to the great amount of painstaking work Mr. Tolles was able to accomplish. He kept up the struggle for existence to a remarkable degree. Mr. Rogers said the society's duty is to erect a fitting monument to the memory of Mr. Tolles, in Mt. Auburn.

Dr. H. J. Detmers, of Champaign, Illinois, spoke earnestly of the business integrity of Mr. Tolles and of the excellence of his work, especially the objectives which yet stand unsurpassed. He urged that the members of the society should contribute liberally toward erecting a monument to the memory of the great optical manufacturer. President Cox suggested that a subscription paper be circulated before the meeting adjourn.

Professor Smith said he had known Mr. Tolles while he was at Spencer's, in Canastota. He believed that the association should show its appreciation of Mr. Tolles in some other manner than circulating a subscription list. He suggested that a committee be appointed to ascertain the amount that should be expended and that the association be assessed for whatever amount shall thus be reported. There was a considerable discussion about the manner of the testimonial, resulting in the adoption of a resolution that Professor Rogers, Dr. Detmers and Dr. Blackham act as a committee to report the best method of showing the association's respect for the deceased Mr. Tolles. The same committe was authorized to take action regarding Chas. A. Spencer.

REMARKS BY DR. DALLINGER.

PRESIDENT Cox announced that he had communicated to Dr. Dallinger that the latter had been elected a permanent honorary member of the organization. Dr. Dallinger said: "Not only on my own account, but on behalf of the Society I represent, I accept the honor with the greatest pleasure. While I

have been among you I have felt that my interest in microscopy has widened. I feel that there is more earnest work being done here than I have hitherto realized. Anything I can do to further your interest I shall do with the greatest pleasure." After referring in complimentary terms to President Cox's address, Dr. Dallinger alluded to the death of Robert Tolles, saying the English microscopists regretted the decease of the eminent optician fully as deeply as American scientists had done.

A NEW FORM OF SECTION CUTTER.

BY PROF. WM. A. ROGERS.

PROFESSOR William A. Rogers read a paper on a "New Form of Section Cutter." The two features of a section cutter in which the speaker thought improvement could be made were: First, a method of moving the plate to which the section to be cut was attached over a definite and a known distance. Second, a method of firmly holding the plate in position during the operation of cutting the section. The speaker said it was proposed to move the plate between two vertical walls as guides over the distance required as indicated by a graduated scale attached to the plate and in the focal plane of an objective attached to the frame upon which it moved. The movement of the plate might be made either by a screw or by tapping with a small hammer. In order to hold the plate firmly in position after the movement had been made under the microscope the plate rested upon the poles of four magnets, which projected through the frame from beneath. When the circuit was completed the plate suffered no disturbance, since it rested directly upon the cores of the magnets. Disturbance was only produced when there was motion. Here no motion could take place. Moreover, the observer by an examination of the graduated scale, while the circuit was being completed, could be sure that the operation of clamping had produced no disturbance in position. Professor Rogers illustrated his plan by diagrams on the blackboard.

THE SOIREE.

THE culmination of the convention was reached the evening of the soiree given at the Arsenal by both the American Society of Microscopists and the Rochester Academy of Science and visiting microscopists. There were in all about 3,000 tickets issued in addition to the hundreds of members badges, and the supply run short long before the demand for them ceased. The local committee was hard at work all day arranging the hall and getting tables and microscopes in position. One hundred and twenty-six tables were arranged in lines through the hall, two microscopes being allotted to each table. Nearly every table was fully occupied. By actual count about two hundred and forty microscopes were in use. Allowing the visitor to remain the full two and one-half hours, and take a look at each microscope, to say nothing of the other exhibits, they could tarry only about thirty seconds at each microscope. Notwithstanding the vast number in attendance and the intense heat, the arrangements were so perfect that all were kept scattered over the hall and kept moving in one direction so that there was no jam and everybody had an ample opportunity to see all they cared to see. It was indeed a brilliant assemblage, such as is not frequently seen even in Rochester. Among the distinguished visitors present was ex-Governor St. John, the Prohibition nominee for President, who was a guest of Dr. Harrington for a few days.

An interesting featute of the convention, not heretofore alluded to, was the large and interesting exhibits in the rooms on the second floor of the building, made by various firms in different sections of the country. These exhibits contained every variety of instruments and the apparatus, accessories for mounting, etc. They were a credit to the exhibitors and well repayed an inspection. A collection of books relating to microscopy and kindred subjects was also exhibted.

The artists have given a good photograph, and they offer it, with key, mounted on best card, 20x24, for $2.00, by express; or unmounted, with key, by mail, $1.75. Address

BOWDISH & HOAGLAND,
94 Arcade, Rochester, N. Y.

THE EXAMINATION OF HANDWRITING.

BY DR. GEO. E. FELL.

PROFESSOR G. E. FELL, of Buffalo, presented a paper entitled "Exhibit 'B' Julia Martin and the People vs. Jesse Colby." This, the speaker said, was a remarkable case of forgery which occurred in Erie county. He was called as an expert, and submitted the writing in question to a number of tests, being assisted by Professor Kellicott. A two-inch microscope revealed at the outset that two kinds of ink had been used. Each word was carefully examined and the presence of the difference in the color of the ink noted. Several false strokes of a pen were also easily discerned. He had found by several experiments that, under the microscope, there is no difference in the color of ink dipped from the bottom or from the top of the same bottle. The result of the examination by the experts was to prove that the letters of the contract were retraced for the purpose of adding the words "and Colby's bond is hereby cancelled," by which he would have made $5,000 had not the examination proved that the document had been tampered with.

Professor Lattimore asked if chemical tests were applied to differentiate the inks used. The reply of Dr. Fell was, "No." Dr. Lattimore alluded to the importance of the paper and the value of microscopic observations by those called into courts as experts to decide disputed points about handwriting. He related how a check, claimed to have been signed by a Rochester merchant, had been presented at a bank and paid. The bank teller and the merchant both testified that the signature was correct, and that the amount had been removed and a larger sum had been written in. In this case a banker who had no interest in the case pronounced the signature correct. His attention was called to a pencil tracing where the line was parallel to the ink line. He then said he could see it plainly, and was surprised that he had not seen it before. Experiments were made with chemicals found in the possession of the man who presented the check, and the ink signature was completely removed, leaving the whole signature drawn in pencil with fragments of graphite in the pores of the paper. Professor Lattimore related several other very interesting cases, during

which he stated that it was almost impossible to remove graphite marks because the paper is almost sure to be destroyed. He believes it would be important to use photographic appliances in cases where there is a question as to the different kinds of inks.

E. S. Nott stated what he knew about the case alluded to by Dr. Fell. Dr. James said the only objection to a chemical test was that it is only seldom that consent of all parties can be obtained for the use of chemicals. Dr. Mercer related his experience in examining a document in which words had been added after it had been drawn. Professor Stowell explained the experiments he had made with different inks and with the appearance of crossings of lines drawn at different times. President Cox entered into the discussion, stating that there is no testimony on earth so useless as that of professed experts of chirography. Professor T. J. Burrill said he had made special experiments regarding the color of different inks which satisfied him that careful observations are sufficient to determine whether inks are of the same or different qualities.

NOMINATIONS.

THE nominating committee consisted of Dr. Henry Mills, R. H. Ward, Dr. Blackham, Dr. William J. Lewis, Dr. Henry D. Kendall, Professor S. H. Gage and E. S. Nott.

They recommended the election of the following officers:

President—William A. Rogers, of Cambridge.
First Vice-President—H. F. Atwood, of Rochester.
Second Vice-President—C. H. Stowell, of Ann Arbor.
Secretary—D. S. Kellicott, of Buffalo.
Treasurer—George E. Fell, of Buffalo.
These were all unanimously elected.

Professor Rogers, however, stated that he intended to be abroad next summer and could not accept. After the most repeated urgings he still declined to serve, and the committee were asked to bring in another nomination.

It seemed to be generally understood that the honor would be offered to one of two parties; either Professor Burrill, of Champaign, Ill., or Professor Smith, of Geneva, N. Y.

The committee, however, reported the name of Professor Smith and he was unanimously elected.

Editorial Department.

AS NATURAL AS LIFE.

We have received a photograph of the members of the American Association in attendance at the Rochester meeting. About seventy faces are clearly shown on the card, and an accompanying key tells the name of the owner of each face.

They are all there; from "fresh-water sponges" at the extreme right to general "vegetable sections" at the extreme left. The sparkling eyes of Mr. Brearley are a little too prominent to be natural, although this may be due to the fact that he is looking too intently for the luxurious growth of hair so unkindly hidden by Mr. Griffith's cap.

Poor Mr. Earle is vainly trying to catch the eye of the Junior Editor, who is sweetly smiling, all unconscious of approaching conquests. Professor Gage is nearly lost behind the slender scalpel from the city hospitals of St. Louis.

Dr. Moore is evidently standing on a box trying to determine which is the *longer;* he himself, or the time of exposure of the plate.

Dr. Chase is trying to wink a fly off his forehead, much to the amusement of the little man with the glasses. One of the ladies is about to cry as she recalls the fact that a white dress will not take on an old-gold shade in a picture. "Hair" (microscopically considered), has been sacrificed so freely to determine whether it were human or not, that only a little shows on the lip and head of the consulting surgeon from Hartford; while with depressed chin and knitted brow the Senior Editor is quietly and tremblingly whispering: "Please hand me your dollar for volume IV."

THE MEETING AT ROCHESTER.

We have given a few extracts from some of the papers presented at the Rochester meeting in order to give our readers something of an idea of what was done. The whole proceedings were characterized by much earnestness and enthusiasm, and once more it can be said that the last was the very best.

THE GUNDLACH OPTICAL COMPANY is the name of the new firm that will offer Mr. Gundlach's objectives in the future. They are already located at 45 Stone street, Rochester, N. Y., and now "offer the very finest optical apparatus at the lowest possible figure."

Mr. Gundlach has returned to Rochester and will give his undivided attention to the work. A full page advertisement will appear in our next issue. In the meantime send to them for a circular.

We are sure our readers will excuse the delay in issuing this number of the journal when they learn that from the second to the fifteenth of the present month the junior editor was quite ill at Philadelphia. Occurring at just this time and so far from home it was impossible for us to appear earlier.

In response to an invitation from Messrs. Bausch & Lomb, the members of the society enjoyed an evening at their manufactory on St. Paul street. The grounds were brilliantly illuminated. All the departments of the manufactory were in operation and the visitors made a thorough inspection under the guidance of several employes, who explained all the processes. Later the visitors assembled in a large tent on the grounds where an elaborate supper was provided.

We have a number of original communications on hand that will appear in our next issue.

It was a pleasure to sit under the rulings of such a dignified and ready president as the Hon. J. D. Cox.

Selections.

THE PREPARATION AND MOUNTING OF INSECTS.

There are several processes for preparing and mounting insects, each of which possesses special advantages, in respect of the results and appearances it may be desired to obtain. Whenever it is possible, and except for special purposes, and in dissections, Insects should be mounted "without pressure," since the flattening them out under pressure results in distortions, displacements of the parts and organs, and unnatural, and therefore, false appearances. It is, however, impossible to mount all insects, or their parts, without pressure, and the following process will give good results:

Place the insect in pure Liq. Potass; mix with one-fifth ammonia fort. The insect must not be allowed to remain too long in this solution, and must be tested from time to time by placing it in water and pressing the thorax. When the thorax is soft and the legs flaccid immerse the insect in water for from 16 to 24 hours, then soak it in glacial acetic acid and glycerine (half and half) for some hours.* Again, immerse it in water for from 12 to 24 hours; it is now ready to be laid out upon the slip; having done this, preserving the natural position of the parts as closely as possible, place a cover over the insect and tie lightly round it with soft cotton, stand the slip on end to drain, plunge the slip into a turpentine bath and leave it until all moisture has been driven out and the insect is thoroughly permeated by the turpentine, drain off the turpentine, apply blotting paper to remove any excess of turpentine from under the cover, and run in "Benzole-Balsam" by capillary attraction. The cover should never be lifted or allowed to shift its position after the insect has been laid out.

When it is desired to preserve the brilliant or delicate colors of an insect, it should be placed, immediately after being killed by means of Chloroform, in Liq. Potass, *without any mixture of Ammonia*, for from two or three days, then soaked in water for 24 hours, then placed in water, with 10 drops of muriatic acid to each ounce of water, for 24 hours, it should then

be laid out and immersed in turpentine and treated as already described.

In order to mount insects, or their parts, "without pressure," it is generally necessary to adopt only the following simple process:—Soak the insect for two days in equal parts of ordinary alcohol and water, after which transfer it to absolute alcohol for two days, immerse it in turpentine until it is not only completely permeated therewith and all air removed, but let it remain until it is sufficiently bleached or decolorised—in other words, rendered transparent—and in order to ensure this result it should be placed in a strong light. Select a cell, of the requisite depth, of pure tin or vulcanite, which affix to the centre of a slip with the French Liquid Glue; when this is dry, having cleaned the interior of the cell, place within it the insect, and fill the cell with fairly thick Balsam until it presents a slightly convex surface above the cell, lay it aside, as previously recommended, under cover from twelve to twenty-four hours so that all air may escape, put a minute drop of fresh Balsam upon the surface of the Balsam which fills the cell, and carefully place a cover, slightly warmed, upon it, close the cell by gentle and equable pressure, at once remove, by means of a soft brush and benzole, all Balsam which has exuded under the pressure, let the mount harden for a day or two, and then apply white zinc, cement or asphalte.

Cells are to be obtained of various sizes, having pure tin caps to fit exactly over them, after the cover is applied, and these not only impart great strength and security to the cell, but ensure the neatest possible finish to the mount. Mr. F, Enock, whose exquisite entomological preparations are altogether unrivalled, is to be credited with this admirable device, as well as with various other improvements in the special branch of the art, to which he has devoted himself with such singular success.

THE PREPARATION OF VEGETABLE SECTIONS.

Whensoever possible stems, leaves, roots, petioles and wood should be cut fresh and sectionised as soon as may be—all such specimens should be kept in a mixture of equal volumes of

alcohol, glycerine and water. Sections also may be stored in this mixture. Nearly all vegetable sections require bleaching before being stained; very delicate tissues may be bleached by means of alcohol—hard and deeply-colored stems and woods must be bleached in a liquid thus prepared:—

To one pint of water add two ounces of fresh chloride of lime; shake this up thoroughly two or three times, and allow it to stand until the lime shall have settled. Make a saturated solution of common "washing soda." Pour off the supernatent fluid from the chloride of lime, and, by degrees, add to it the soda solution, until all precipitation ceases. Filter the solution, and keep it in a stoppered bottle, in the dark. No fixed time can be given for the bleaching process, the color and density of tissues being so variable. Experience, however, will be rapidly gained, and over-bleaching easily avoided. The sections being bleached, must now be washed in distilled water, several times changed, and allowed to remain for twenty-four hours in the final water, to which add 8 or 10 drops of nitric acid to each half-pint. Transfer the sections to alcohol, for an hour before staining them. To bring out details of structure and to display cell walls, &c., there is no better stain than Logwood, and for singly stained vegetable sections it is to be recommended in preference to all other staining fluids. The following process will give admirable results:—

1st. Remove the section from alcohol to water for a few minutes.

2d. To 3 per cent. alum solution for ten minutes.

3d. Stain in aqueous logwood stain.

4th. Place in alum water to remove stain from surface.

5th. Wash thoroughly in water.

6th. Place in alcohol for two or more hours. Float the section lightly on the surface of oil of cloves; when it sinks it is ready to be mounted in Balsam.

TO DOUBLE STAIN VEGETABLE SECTIONS.

1st. Place the section in an alcoholic solution of Iodine Green (3 grains to the one ounce of alcohol) for one or two hours.

2d. Soak it in alcohol for ten minutes.

3d. Remove it to water for one minute.

4th. Immerse it for two hours in Carmine fluid, made as follows:—Carmine, 15 grains; Ammonia, 15 grains; Water, 2oz. Dissolve the carmine in the ammonia by means of gentle heat, add the water, and filter.

5th. Wash thoroughly in water.

6th. Place in alcohol for ten minutes.

7th. Float upon oil of cloves and mount as previously described.

Mr. Gilbert, whose vegetable preparations are most successful, recommends the following double-staining fluid, in which the sections are immersed, and which produces perfect differentiation. Dissolve of Magenta Crystals $\frac{1}{4}$ grain in 1 ounce of alcohol, and of Nicholson's soluble blue one sixth grain in 1 ounce of alcohol; add to this 4 drops of nitric acid. Filter both solutions.

To two parts of the blue add 7 parts of the magenta solution. Immerse the section for from 1 to 2 minutes, remove it to absolute alcohol, thence to Benzole (to fix the magenta); thence to oil of cloves, and mount in Balsam.

PICRO CARMINE, DOUBLE STAINING.—Picro Carmine as a selective double stain cannot be surpassed. The process is as follows:—Take of carmine 2 grains, liquor ammonia $\frac{1}{2}$ drachm, distilled water 1 ounce; dissolve the carmine in the ammonia by means of gentle heat, add the water. Dissolve 8 grains of picric acid in 1 ounce of alcohol, also by means of gentle heat, and mix the two solutions.

Place the sections in alcohol for one hour—immerse them in the recently filtered staining solution for from half an hour to three hours—*i. e.*, until they are sufficiently stained,—wash them in alcohol, immerse them in an alcoholic solution of Picrate of ammonia for one hour, and for a second hour in a like solution, in other words, change the solution once during the two hours. Place them in alcohol for a few minutes, and in oil of cloves as already described, and mount in Balsam.—*From "Cole's Studies" for June.*

*Insects removed from Liq. Potass, after being soaked in water for 24 hours, should be kept in strong, or glacial, acetic acid and glycerine (half and half) until required for mounting.

Reviews.

THE WORLD'S OPPORTUNITIES, AND HOW TO USE THEM. By A. H. Guernsey, Ph. D. Illustrated. pp. 600. 1884. Harper and Brothers, New York.

Mr. Guernsey's work contains essays on farms and farming, trades, professions, manufactories and fine arts. He has brought together a vast mass of facts bearing upon the present and future of the country. The author tells us how to avail ourselves of the limitless resources of our own country, pointing out clearly that the world's opportunities lie right here in the United States. It will be a standard work of reference in regard to all our industrial pursuits, and is full of facts and figures.

The illustrations are unusually good, consisting of engravings of famous paintings, and pictures of almost everything in the universe.

The work is sold only by subscription. Address J. R. Mattick, Jr., Roxboro, Philadelphia, Pa.

THE CENTURY.

The *Century* will begin with the November number a series of articles on the great engagements of the war. The papers will be contributed by officers high in command at the time, either upon the Union or Confederate side. Gen. Grant, Gen. Beauregard, Gen. McClellan, Admiral Porter, and many others have already been engaged. Great stress will be laid upon the human and heroic aspects of the great conflict. It is an important enterprise that the American reader will not be slow to appreciate.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge.)

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

N. A. RICHARDS, of St. Louis, Mich., has for exchange a few mounts of double-stained and single-stained vegetables; also a number of well-mounted injected specimens.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill

---

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

FOR SALE,—Slides, double stained, of Bacillus Tuberculosis, 50c. each. DR. W. R, CHITTICK, 83 Lafayette Avenue, Detroit, Mich.

WANTED.—Books treating on microscopical and histological subjects not already in my possession. Will pay cash or give slides in exchange. State name of the work, date of issue, and price. C. H. STOWELL, Ann Arbor, Mich.

WILL Exchange mounts of stained vegetable sections for other mounts of interest. MRS. L. R. LOOMIS, Ann Arbor, Mich.

AMPHIPLEURA PELLUCIDA or any other test diatom mounted in the new medium having refractive index of 2.4 can be procured from H. H. CHASE, M. D., Geneva, N. Y.

SECTIONS of bone of cat, and purcupine quill, seed of Papara somniferum and Lychnis githago, eye spots and pieces of wings of Attiacus cebropia and prometheus, etc., for other good slides. HOWARD N. LYON, 80 South St., Auburn, N. Y.

I WILL send a quantity of good diatomaceous material containing Bacillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Euglena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

WILL Exchange mounted slides of various crystals, diatoms, in situ, stellate hairs of plants and micio fungi, for other good slides or material. JAMES E. WHITNEY, Rochester, N. Y.

PATHOLOGICAL, Histological and other well mounted slides will be exchanged for mounted specimens of interest. Lists furnished on application. D. E. HAAG, M. D., Liberty Center, Henry County, Ohio.

WOULD like to exchange a 1-6 objective, 160°, adjustable, for a lower power. A. Y. MOORE, 89 Prospect street, Cleveland, Ohio.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

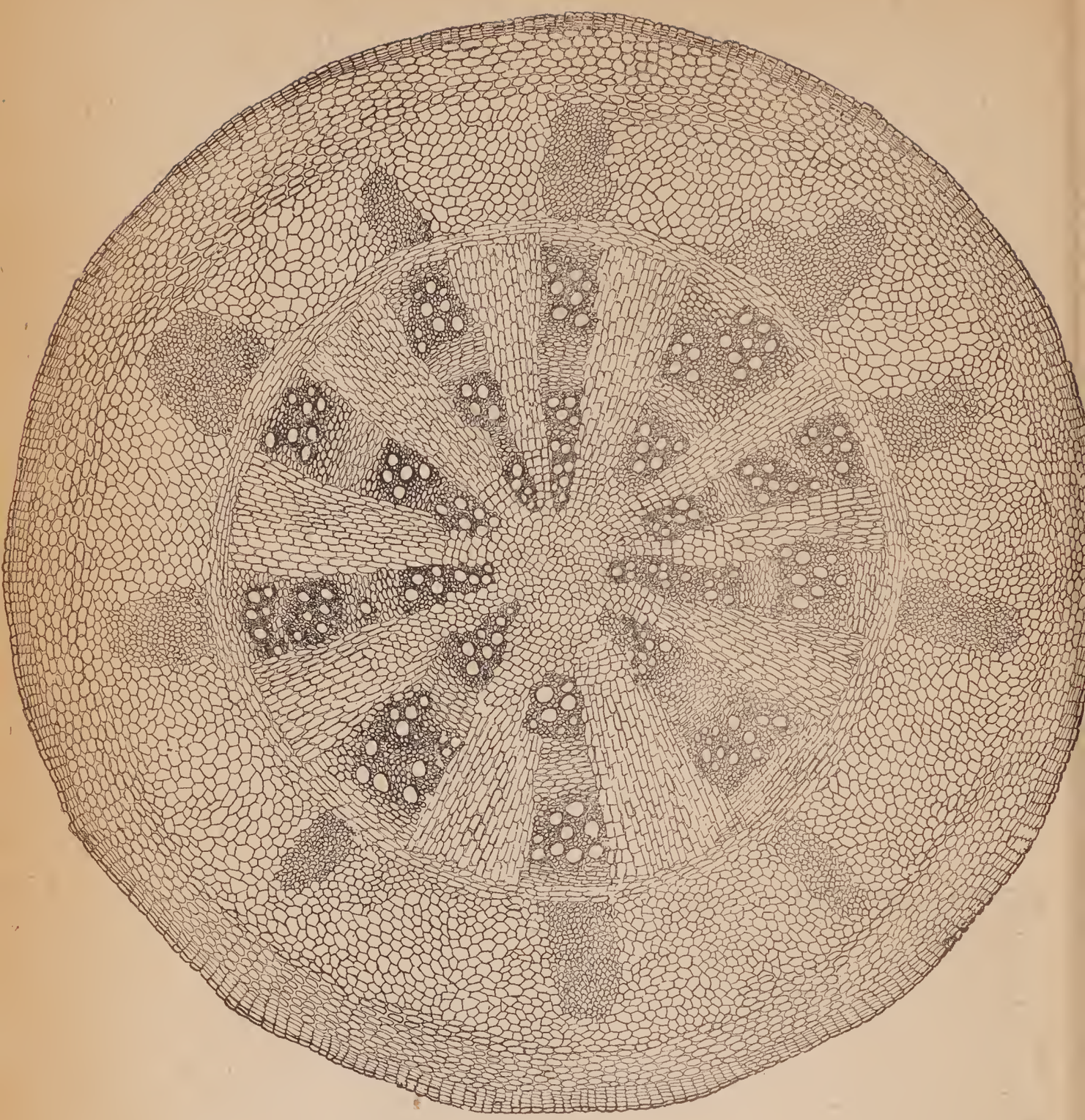


FIGURE 1.

Figure 1. Complete cross section of the rhizome of Hydrastis canadensis.—(Magnified 20 diameters, and reduced ⅓. For reference to parts, see Fig. 4.)

Figure 2. Cross section of the root of Hydrastis canadensis.—*a*, outer row of cells; *b*, parenchyma of the root; *c*, row of cells bordering the woody bundle; *d*, reticulated cells; *e*, central woody parenchyma; *f*, wood prosenchyma; *m*, root hair; (magnified 75 diameters and reduced ⅓.)

Figure 3. Longitudinal section of the root.—*a*, outer row of epidermal-like cells; *b*, parenchyma; *c*, border cells of the woody bundle; *d*, reticulated cells; *e*, wood parenchyma; *f*, wood prosenchyma. (Magnified 75 diameters, and reduced ⅓.)

Figure 4. Cross section of the rhizome.—*a*, cork cells; *b*, green layer of the bark; *c*, liber layer of the bark; *d*, cells of the newly-formed cambium; *e*, medullary rays; *m*, woody bundle with prosenchyma, parenchyma and reticulated cells; *g*, pith. (Magnified 75 diameters, and reduced ⅓.)

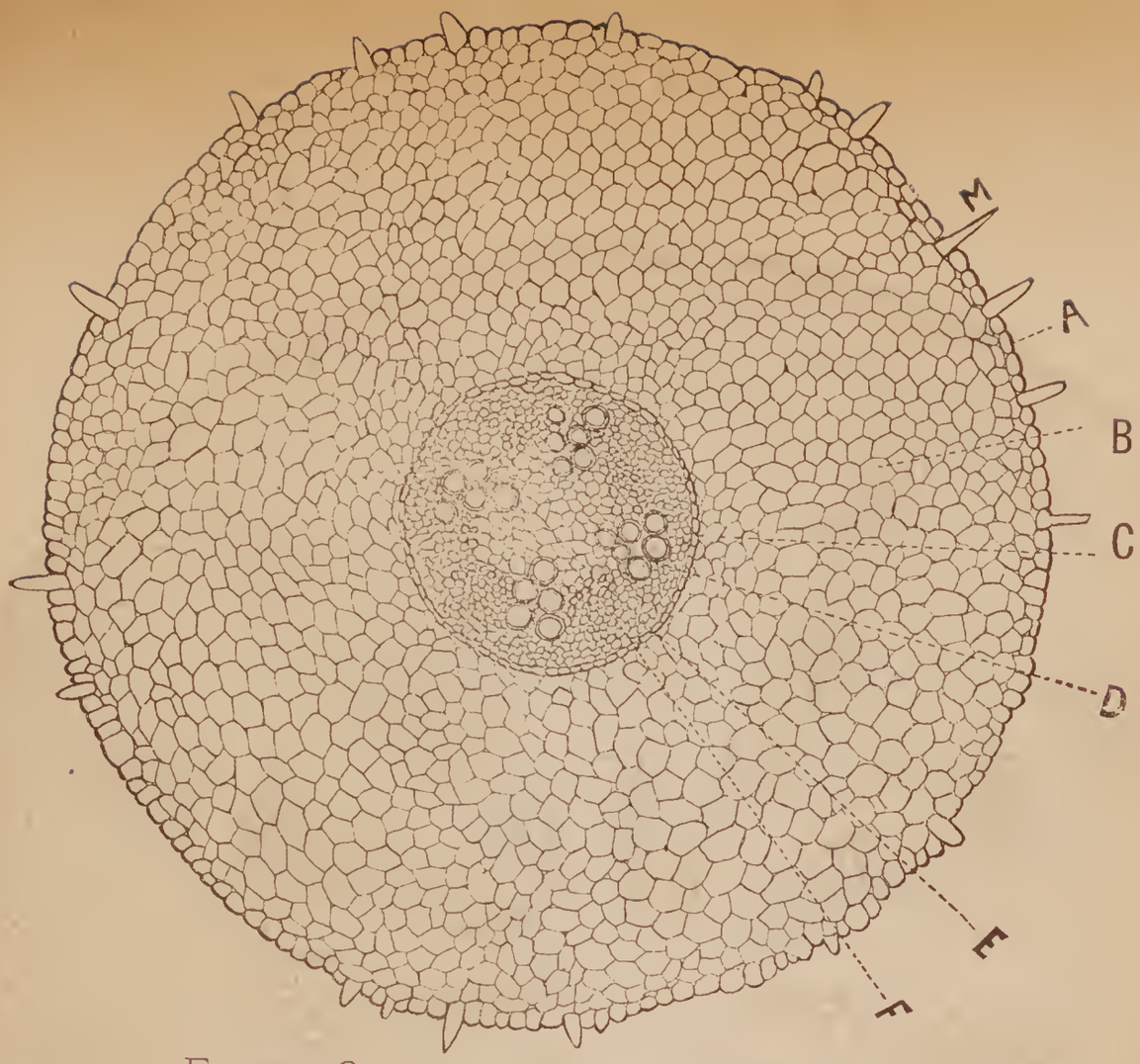


FIGURE 2.

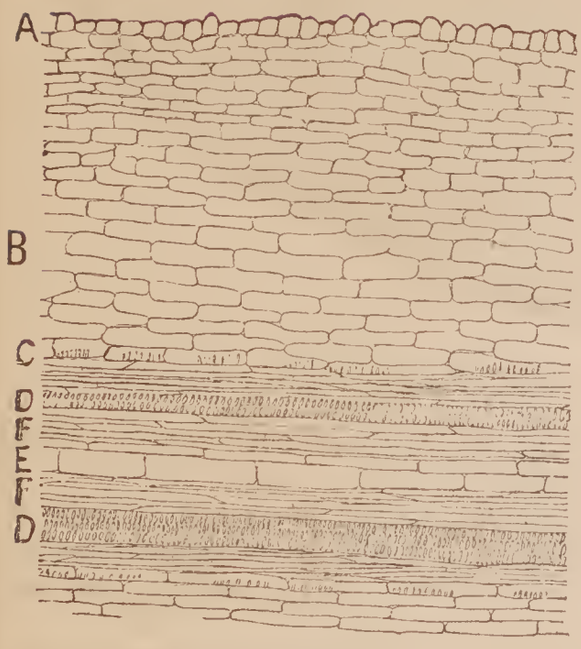


FIGURE 3.

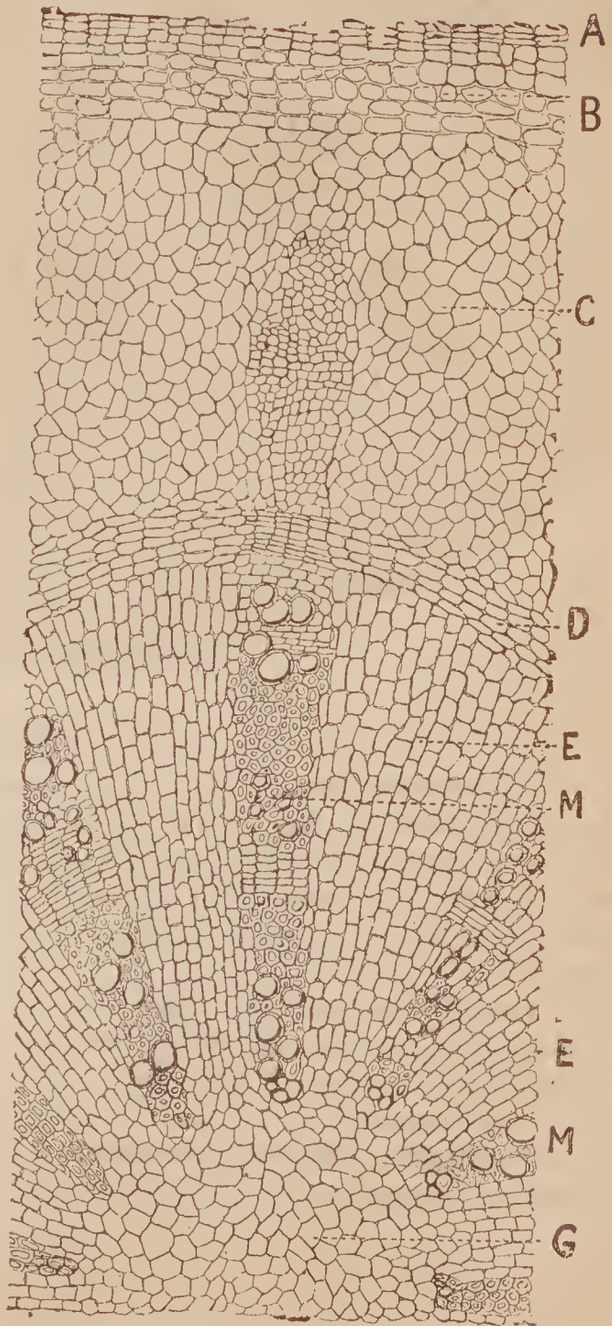


FIGURE 4.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, OCTOBER, 1884. No. 10.
WHOLE No. 27.

Original Communications.

THE MICROSCOPIC STRUCTURE OF HYDRASTIS CANADENSIS.

BY LOUISA REED STOWELL.

HYDRASTIS CANADENSIS, or Golden Seal, is perhaps the most important of American drugs. It is indigenous to Canada and the eastern part of the United States.

The rhizome is from one to two inches long, and about a quarter of an inch thick. The cork upon the outside is composed of from four to eight rows of thin-walled, tabular cells, of a dark brown color, with broken and irregular walls; the outer edge of the cells frequently being darker than the inner. The green layer of the bark is composed of from twelve to fifteen rows of oval, clear white, thin-walled cells of parenchyma, loaded with starch grains, chlorophyl bodies, oil, and protoplasm. The corners of these cells are thickened, leaving many little open spaces between the cells. The liber layer of the bark is very similar to the green layer, only that the cells are more compressed, fitting into each other so closely as to leave no intercellular spaces.

The cambium is composed of several rows of brick-shaped or tabular cells, separating the bark from the wood. They are clear white, with exceedingly thin walls, and contain only protoplasm.

The medullary rays are quite wide, and composed of a number of rows of parenchymatous cells, stronger and thicker walled than the cambium cells, and loaded with starch grains.

The pith has the usual appearance of large, hexagonal cells of parenchyma, loaded with starch grains.

The woody bundles between the medullary rays, the cambium and the pith, are not fully developed. There are a few small reticulated cells, with pointed ends, and surrounded with a small amount of prosenchyma and considerable parenchyma. The reticulated cells have thick walls, and are not parallel with the surface of the rhizome; so it is quite difficult to obtain a good longitudinal section of them. The prosenchyma is in clusters around the reticulated cells, and is of a bright yellow color.

Every part of the rhizome, excepting the cork and woody bundles, is loaded with minute starch grains. These are nearly round, with no distinct rings or nucleus, and about 1-4000 of an inch in diameter. Occasionally they are found in groups of three, like the starch grains of sarsaparilla.

In the center of the root is a woody bundle. It is not perfectly developed, and often four clusters of reticulated cells are placed equal distances from each other. At the very center is found a small amount of wood parenchyma. The cells of the prosenchyma found in the woody bundle are short, and with thin walls. Surrounding the woody bundle is a single row of parenchymatous cells, with the inner wall frequently thickened like stone cells. This row is slightly tinged with yellow, and closely resembles the nucleus sheath of monocotyledonous roots.

The principal bulk of the root is found outside of the woody bundle, and is composed of simple parenchyma loaded with starch grains. This tissue occupies fully four-fifths of the entire root. On the outside of this parenchyma, and surrounding the entire root, are two or three layers of dark brown, brittle, empty cells, closely resembling the cork cells of the rhizome.

All parts of the root, excepting the woody bundle and the epidermal-like cells, are equally loaded with starch grains similar to those of the rhizome.

A QUEER RHIZOPOD.

E. A. CONGDON.

THE accompanying sketch represents a peculiar form of *Difflugia pyriformis* recently observed. The neck is greatly produced, giving the rhizopod a very awkward appearance. The fundus is composed of small irregular particles of quartz, while the neck is formed of much larger pieces. No pseudopods were seen. It was found in the ooze of a pond among many other Difflugia, but was the only one of its kind observed.

It is $\frac{1}{100}$ of an inch long, and $\frac{1}{400}$ in width; the neck is $\frac{1}{1000}$ of an inch in breadth and $\frac{1}{350}$ long, making it nearly twice as long as the rest of the shell.

Leidy in his Monograph of the Fresh Water Rhizopods of North America, describes five varieties of *D. pyriformis*, but to none of them does the specimen under consideration conform.

It might be defined as the characreristic form of *D. pyriformis* with a greatly prolonged neck.

IDENTIFICATION OF BLOOD CORPUSCLES.

BY R. U. PIPER, M. D., CHICAGO, ILL.

Falsus in unum, falsus in omnibus.

AS a small contribution to the literature of "Blood Identification" I send you a table of the measurement of blood corpuscles from thirteen young dogs, selected out of like tables of measurement of more than four hundred dogs—setters, spaniels, pointers, curs, poodles, etc., etc., which agrees with and

fully confirms Dr. Woodward's statement, quoted by Dr. Up De Graff, in your magazine of December, 1883:

"The average of all measurements of human blood I have made is rather larger than the average of all measurements of dog's blood. But it is also true that it is not rare to find specimens of dog's blood in which the corpuscles range so large that the average size is larger than that of many samples of human blood."

I do not mean to say that I can meet with a like practical demonstration the statement in regard to thickness of cell wall, etc., because negative testimony in this respect, might only serve to show incapacity of manipulation on my part; but I must say, that so far as I know, his, Dr. Up De Graff's results in these respects are wholly confined to himself, and I will take the liberty of adding, in the language of the compeers of M. Baruel: "It is true that M. Baruel is able to distinguish between the blood of the various species of animals by its odor! But this test has a somewhat hypothetical value for scientific purposes. The point of admiration belongs to the original."

In a note on page 212 of the magazine, the Dr. further says:

"It is presumed to be an admitted fact, that the blood corpuscles of the horse, cow, pig, sheep and goat, being so much smaller than man's, their identification is easy of procurement."

Now I deny all this most absolutely. I do not believe that a single scientist, with the exception of Dr. Up De Graff and M. Baruel, makes any such claim whatever. If we find blood corpuscles which average as much larger than these, as do those of man, we could say that they did not come from these animals, and that they might be from the human animal, or from dogs, etc., but there is no such thing as "identification" in all this.

As between the blood of these animals and human blood, if we are confined to such question, and the corpuscles were of the average size of the human, we could of course pronounce absolutely; but not the negative of this if they chanced to be small like the corpuscles of these animals, for under certain conditions, as I have found in my experiments, blood corpuscles shrink a good deal in drying. These conditions are well known however, and do not very often exist. It is a settled fact, thus far, that blood corpuscles in drying upon any hard substance do not shrink in the least degree. The fact of shrinking in any case would not affect the question in which the blood under exami-

nation was claimed to be that of any animal, whose corpuscles are much smaller than those of man, and where the corpuscles found, as the result of such examination, were as large as the human.

I object to the word "restore," as used by this writer. If he means by it that as the result of his manipulations, shrunken blood corpuscles are brought back to their original size in a given case, how can he say what their original size should be; or that by his enlarging process he does not carry them beyond their original or normal size?

It is only from the fact that dried blood corpuscles do not undergo change of form or size in our manipulations with reference to measurement, that we can claim in any manner, to separate the corpuscles of one animal from that of another. It would seem further, that by the use of the term "roundest," by this author, in connection with the description of his "restoring" process, that he intended to convey the idea, that by this process, (like as by the action of certain reagents upon fresh blood), he was capable of changing the disc-like form of the dried blood corpuscle to the globular form. Or rather, perhaps, he means by "select the roundest," on page 213, that we should select the "circularest" (Mr. Weller?) or those nearest to a circular form. On page 214, which follows this description of "restoring" blood corpuscles, which I did not notice until the above was written, he says:

"The human corpuscle will expand to the rupturing point and collapse much sooner than will that of a dog, when treated precisely alike."

This fully justifies all that I have said above.

If the human corpuscle will (for this is the state in which they are presented to us for examination in legal trials,) "expand to the rupturing point" by any process of "restoration" there must be a time in this expanding process when the corpuscle has not reached this point. It might be well to inquire at what time, while this process is going on, the corpuscle becomes of its normal size, and how we are to determine, when and where this point is reached? And further, we might ask, as to how, after this point is ascertained, we shall stop the process of expansion so as to measure the said corpuscles? I close by saying, that it seems fully evident to my mind that all

the important propositions in this paper are obnoxious to like criticism, and that the motto at the head of my communication may well apply to them.

It certainly seems to me that if in legal tribunals testimony based upon such so-called scientific investigation as this should be received as evidence, that such a state of things would be fraught with grave danger, as it regards the ends of justice, and also to the reputation of those so-called scientists, who should so testify: "The human red corpuscles will average much larger than those of any dog." (Dr. Thad S. Up De Graff, in The Microscope, and its relation to Medicine and Science, etc., Dec. 1883, page 214.)

In reply I give the following table, premising it with the remark that Drs. Woodward, Richardson, Treadwell, and many others, together with the French, German and English Observers in this field, as far as I am informed, agree with the conclusion thus set forth in my table:

PUPPIES' BLOOD.

No.	Average in millionths of an inch.	Average in vulgar fractions.	Largest corpuscle.	Smallest corpuscle.
1	3017	1-3314	1-3022	1-3764
2	3063	1-3264	1-3020	1-3354
3	3087	1-3239	1-3000	1-3360
4	3069	1-3275	1-2857	1-3846
5	2938	1-3414	1-3163	1-4150
6	3001	1-3324	1-2936	1-3447
7	3081	1-3274	1-2829	1-4370
8	3072	1-3255	1-2847	1-4975
9	3043	1-3286	1-2755	1-3846
10	3069	1-3258	1-2847	1-4275
11	3137	1-3187	1-2549	1-4663
12	3098	1-3227	1-3026	1-3846
13	3015	1-3316	1-2944	1-3846

This table was made from the blood of puppies of different ages, varying from a few days to several weeks. I have found in a few cases the blood corpuscles of adult dogs, corresponding in size with the above. I add a table made from the blood of three infants: The first, two weeks; the second, one day; the third, two days old:

No.	Average in millionths of an inch.	Average in vulgar fractions.	Largest corpuscle.	Smallest corpuscle.
1	3497	1-2854	1-2531	1-4545
2	3508	1-2847	1-2530	1-5400
3	3441	1-2931	1-2538	1-4560

THE ANNUAL PROCEEDINGS.

IN MY "DEN," NEAR THIBODEAUX, LA.

HOME again. Referring to your good-humored *response* under the "Bausch and Lomb tent," on evening of Aug. 21st, 'tis very evident that you have had lots of voluntary advice as an editor, hence sufficiently case hardened to bear a little more.

While we all regretted the delay of "Proceedings of A. S. M.," for 1882-3, did not THE MICROSCOPE, p. 39, February No. of 1884, regret most too loudly, considering our worthy Secretary and Treasurer were not permitted to call in the aid of the scissors?

This year I'm a self-constituted committee of one to "hurry up" the proceedings. Five days after the adjournment of A. S. M., I found Messrs. Kellicott and Fell already devoting every spare moment to the work, and my report, after several days personal investigation, is that they have a six months' job on hand for any one man. There are illustrations which must be redrawn before suitable for the engraver. Others require two or three trips through the mail from extreme northeast and southwest to Buffalo, N. Y., and the same is needed for many of the papers, although every effort has been made to prevent such a necessity. Now all this requires time, and as we have no Gould or Vanderbilt to cash the bills, a careful eye is required to shape the garment according to "cash on hand." By the way, why has it not occurred to some one with his millions locked up, to immortalize himself by a liberal endowment of the A. S. M.? 'Tis doing work which will tell for the good of all mankind. There's a chance for some philanthropist—who'll take the hint?

Now, my dear Editor, the ones having the proceedings in hand will rush them through at as early date as possible, and *don't you scold* it it should take them "five months." "Thirty days" not time enough, Doctor, to build up a compound fracture case.

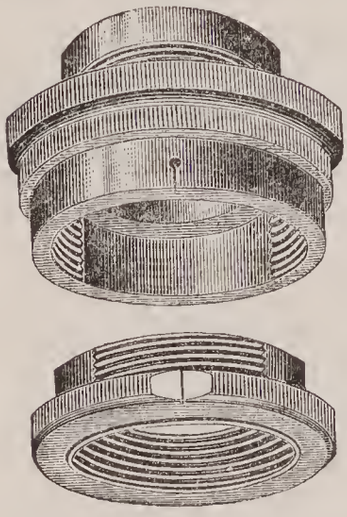
Yours truly,

GREY BEARD.

In the Swamps of Louisiana.

ZENTMAYER'S NOSE-PIECE.

THE new detaching nose-piece consists simply of an adapter with the Society screw to be attached to the microscope. The screw is provided with a jam nut, to enable one to bring the index of the adapter in front of any microscope. One screw of the adapter has the opposite quarters of its screw threads removed.



Collars are furnished to attach to the objectives, having the same screw of which the corresponding opposite quarters are removed. When the indices of the collar and adapter correspond, the collar will enter and it requires only one-quarter turn to screw it home, one hand only being used.

It is as rigid as an ordinary adapter with full screw; it is light, short and durable, and most of the objectives with the collar on, will fit their boxes.

EASY METHOD OF OBTAINING BACTERIA.

BY J. M. ADAMS.

DISSOLVE analine violet, blue, or brown in glycerine, with or without alcohol or carbolic acid. Prepare thin covers by dropping with pipette a drop of thin bacterial fluid on each, and allowing it to dry thoroughly. Cover the dried bacterial film with a drop of the staining and let it remain an hour, or long enough to stain deeply. Put a drop of water on center of slide and invert the cover on it ready for mounting, letting it sway slightly to and fro to wash away a part of the surplus staining and glycerine, but not to remove the film. Press down the cover with a blotter, which will absorb the surplus, and ring quickly. The glycerine being washed away in part does not materially dim the bacteria or affect the analine, and it is surprising how distinctly visible all kinds of bacilli spirallæ, and some of the bacteria and micrococci appear by this process.

One pleasant advantage is the freedom from sediment, as is

apt to occur with other methods of staining, and the ease with which the depth of coloring may be regulated, as well as the reliable work for time being. A novice need not dread or pass over bacteria as difficult objects to obtain or prepare, especially when so easily and beautifully stained, and with the help of a small and inexpensive English work just out, "Grove's Synopsis of Bacteria," well illustrated, he can distinguish and name nearly all the species quite correctly, provided he has somewhat high powers to work with.

ASPECTS OF THE BODY IN VERTEBRATES AND ARTHROPODS.

UNDER this title, quoted from Owen, Dr. Packard discusses in the September number of the *American Naturalist* some of the differences between the vertebrates and insects, especially those presented by the nervous system. The *raison d'etre* of the paper seems to be a criticism by Owen of a statement made by Packard that "the brains and nervous cord of the fish or man is fundamentally different, or not homologous with that of the lower or invertebrated animals."

Dr. Packard attempts to sustain his position, but it seems to the writer that he is singularly confused in his ideas of homology and ignorant of some of the most important papers bearing on this subject, and the closely related one of the origin of the vertebrates. Besides the older papers of Semper and Dohm he seems unfamiliar with the following, which have a direct bearing on the subject in question: Balfour, chapter on "theAncestral form of the Chordata" (Comp. Embr. ii p. 259, 1881); Dohm (Naples Mittheilungen for 1881 or 1882, the exact reference is not at hand); His "Untersuchungen über die Entwickelung Von Knochenfeschen, u. a." (Zeitsch. Anat. u. Entw. i 1875); Hubrecht "on the Ancestral form of the Chordata" (Quart. Jour. Micros. sci xxiii 1883); Küpffer "Die Gastrulation an den Meroblastischen Eiren der Werbelthiere" (Arch. f. Anat. u. Phys. 1882); Sedgwick "on the origin of Metameric Segmentation" (Quarterly Jour. M. S. xxiv 1884); Whitman "Embryology of Clepsine" (Q. J. M. S. xviii 1878), and "a rare form of blastoderm in the chick" (*l. c.* xxiii 1883) and Wilson

"Mesenterial filiaments of the Alcyonaria" (Mittheilungen a. d. Zool. Sta. Neapel v. 1884).

It now appears that all morphologists, with the exception of Dr. Packard, admit the homology of the nervous system throughout the whole of the Metazoa. In all it arises as a portion of the epiblast which eventually sinks into the underlying tissues. Further, in all forms as far as known, its method of formation can be reduced to one type, a cord of cells arising on either side of the blastopore. In all segmented animals there is a further similarity to be noticed. It consists of a series of ganglia metamerically arranged. These points conclusively prove the homology so far as they go and the only difficulty is one not noticed by Dr. Packard. In the arthropods the alimentary tract passes through the nervous system and in the vertebrates it does not. For our purposes it matters not which explanation we accept; that of Semper and Dohm, who would homologize the hypophysis cerebri with the invertebrate mouth, or that of Sedgwick, who claims that in the vertebrates the preoral portion of the invertebrate nervous system has disappeared; or lastly that of Hubrecht who imagines that the lateral nerve-cords of the Nemerteans have coalesced on the ventral surface of the arthropods and on the dorsal of the vertebrates.

Dr. Packard lays great stress upon the fact that in the nervous cord of arthropods there is an element (which he calls the myeloid substance) which is entirely lacking in the vertebrates, a point which is not beyond dispute. Homology does not demand exact equivalence in minute detail. The arm of a man and the pectoral of a fish are greatly dissimilar, but would Dr. Packard deny their homology?

Another point deemed of great importance is the fact that in the vertebrates the neural cord contains a longitudinal canal which is lacking in the other group. If Dr. Packard will consult a paper by Mr. Adam Sedgwick (Proceedings of the Cambridge Philosophical Society, iv. p. 325) he will find some valuable hints upon this point, which go to show that the vertebrates left the main invertebrate stock before the great majority of the invertebrates. As used by Dr. Packard the fact proves nothing. It is not alone the presence of this cord which gives the ascidian its place among the vertebrates; notochord, endostyle,

gill slits, and many other points of structure are fully as important.

The statement that the nervous cord of arthropods at first appears as a series of disconnected ganglia and hence cannot be homologized with that of vertebrates, is at once negatived by the fact that in both insects and crustacea the nervous system usually arises as longitudinal ridges which later become segmented into ganglia. The earlier stage seems to have escaped Dr. Packard. Even were he correct the two would still be homologous, the metamerism of the mesoblast affecting the one at an earlier stage than the other.

In the last section of his article our author seems to have carried his homological skepticism to the greatest extreme and to be decidedly unfortunate in some of his comparisons. For instance in denying the homology of the eyes of vertebrates and invertebrates he has mentioned as proving his point their only similarities. His text runs thus: "The eyes of arthropods are not truly homologous with those of vertebrates; the cornea is simply a number of epithelial cells, while in vertebrates the eye externally is an ingrowth of the epiblast." What, we would ask, are the epithelial cells if not epiblastic? Dr. Packard doubts even the homology of the heart in the two groups, and also the relations of the viscera to the body walls. Let us see what are the facts in the case. In both groups the mesoblast arises as an outgrowth from the lips of the blastopore or from the archenteron, though on account of a large amount of food yolk this origin is frequently obscure. In both groups the mesoblast splits into two layers with the body cavity between. The inner of these two laryers, the splanchnoplure, forms the inner wall of the body cavity, while the outer forms the principal part of the body wall, muscles, bones, etc. In both vertebrates and arthropods from this outer layer, the somatoplure, the heart is formed. Need the homology be closer?

In this article it has not been the purpose to support any theory, but merely to show the lack of cogency in the reasoning of our author. Within the last ten years vast strides have been made toward the solution of morphological questions, and when one considers the important bearings of evolution, for to such the question belongs, he is apt to rebel any religation of these subjects "rather to metaphysics than to pure science." N.

Editorial Department.

IMPORTANT ANNOUNCEMENT.

With the November number of our journal we shall add a feature which no doubt will commend itself to our subscribers. We shall try to give abstracts of the more important papers in those departments of science, as histology and embryology, when the microscope is the instrument of research. This will prove especially valuable to teachers and students of natural science, as they may thus keep themselves posted on the most recent advances of science. This department will be under the charge of one of our most advanced microscopists and embryologists. We are not at liberty at present to reveal the name, but our readers have a treat before them.

A WORKING SESSION.

We are in receipt of letters from some of our live, active men, asking us to urge the formation of a society whose sole object shall be the study of methods of work; a meeting of working microscopists. The plan proposed is after the fashion of the working session of the American Society. "Unless Mr. Griffith assumes control again we shall certainly push matters," says a late writer. We cannot advocate this; it would take away two-thirds of the members of the American Society. Let us stand by our organization. "Stand by the king," is good advice. By the way, President Smith assures us in a private letter, that he should exceedingly regret the loss of the working session.

Try it just one more year, Mr. Griffith.

THE GREAT LIGHTS OF THE PAST; WHERE ARE THEY?

In the early days of the American Society, when there were just members enough to fill the long list of officers, there appeared a great and a shining light. It was fastened to an old horse called "angular aperture," whose frantic endeavors to annihilate Prof. Smith, of Cleveland, is a simple matter of his-

tory. That each attempt proved more and more disastrous is easily learned by a perusal of the appendix of Prof. Smith's work on "How to See with the Microscope." This "shining light" endeavored to get a body of scientific men to declare that "angular aperture" was just according to a certain definition. And when this body of men undertook to show this "shining light" that if they should all resolve that angular aperture was just so-and-so, it would not necessarily make it so, said "light" suddenly disappeared. This "light" has never been seen at a meeting of the American Society since that day, and has never emitted a single ray to help it. From that day the American Society has had unparalleled growth and prosperity. We next see this great light throwing out all its power to aid in building up the Section of Microscopy at the meetings of the American Association for the Advancement of Science. For three years it glowed and burned; for three years the Section of Microscopy grew weaker and weaker. There could be but one result, and at Philadelphia the section expired, to the great joy of all men, save one.

But what has become of the light? In New York? No. Shall we go to Boston? No. Perhaps in London? No. Will the friends of microscopy write us, "in a familiar and colloquial style," and tell us where, in their opinion, we may next hope to catch a beam from this great light.

WHAT OUR "FRIENDS" SAY.

We copy the following from an editorial in the September number of the *American Monthly Microscopical Journal.*

Speaking of the Rochester meeting the editor says:

"The papers read were certainly of some interest, but they were not, as a whole, characterized by very profound treatment of the subjects, and it is to be hoped that the next annual volume of *Proceedings* will not be regarded as representing the results of American microscopical investigation and discovery during the past year. The Society undoubtedly has a place to fill, and as an association of amateurs, which it essentially is, it may exert an influence which will lead to truly scientific research with the microscope in the many paths open to the observer.

"The Society has our best wishes, and will have in the future, as

in the past, such assistance and encouragement as it may be in our power to give."

We regret to learn that Mr. Bennett, of London, did not "profoundly treat" his subject. Pres. Cox has our sympathy, because we know now his paper was "not characterized by very profound treatment."

The above articles, together with Prof. Kellicott's, Dr. Blackham's, Dr. Lewis', Mr. Bausch's, Mr. Gundlach's, and others, make it necessary for an editor to hope that "the next volume of *Proceedings* will not be regarded as representing American microscopy!"

We are glad to learn we are classed as an "association of amateurs." Gov. Cox, Prof. Smith, Dr. Blackham, Prof. Kellicott, Prof. Gage, Prof. Lattimore, Prof. Burrill, Prof. Moore, Prof. Rogers, did you know, gentlemen, that the authority from the capital says that you are nothing but *amateurs?* And yet, in the face of all this he declares that, as a society, we have his "best wishes." If the above is a sample of his good wishes and assistance, it is hoped that he will pour out his fiercest wrath, for the above kind of help makes him our worst enemy.

TO SEE IS TO BELIEVE.

In our last issue we purposely refrained from mentioning the "Working Department" of the American Society at its Rochester meeting, for we desired to give it more particular notice.

It seems to have been left to the genius of Mr. E. H. Griffith to invent this department, and how successful the enterprise has been all can testify who have ever attended one of the sessions.

It came to the knowledge of the writer, while at the Rochester meeting, that a certain committee was to render a report that would practically abolish this feature of our annual gathering.

Therefore immediately after the election of officers, and before this committee could get in their formal report, a motion was made that we proceed at once to elect a superintendent of the working session.

Dr. Stowell opened the discussion by attempting to show the value of *seeing* an expert do his work.

The chairman of the committee already mentioned, followed by giving in fact the adverse report already agreed upon.

After remarks by various members it was soon apparent what the society desired, and the motion was carried without a single negative vote.

Mr. Griffith was then nominated and unanimously elected "Superintendent of the Working Session" for another year. But the victory had been no sooner won than it was followed by a tremendous and unexpected defeat in the refusal of Mr. Griffith to serve.

The matter was referred, therefore, to the Executive Committee with power to act. We propose to inquire, first, why did Mr. Griffith decline? and second, what are we to do under the circumstances? Mr. Griffith says that he has not the time to devote to the work; but we believe that this is neither his only nor his chief reason.

We have reasons for believing that if no opposition had shown itself Mr. Griffith would not hesitate to give his time and energy. The real opposition is but slight, for four names will complete the list. We therefore ask Mr. Griffith if he is not willing to go forward with the backing of the whole three hundred members of the American Society, even if four men can be found who are not interested in practical work?

Is Mr. Griffith willing to disappoint three hundred of his friends to please four men? Is Mr. Griffith willing to see such an important feature of the society die because he refuses to serve? We hope and believe he is not.

Under the present circumstances we do not know of a man who would accept the vacant superintendency. As there is but one man qualified to fill the place, it is hoped that no one but that person will occupy it for years to come.

IT TELLS ITS OWN STORY.

Prof. Richards, of St. Louis, Mich., asks us to have his name dropped from our list of "exchanges." He writes that he has made over 400 exchanges and has given all his own slides away. Make some more, Professor, and give us your name again.

Selections.

THE DOCTOR'S PRAYER.

BY M. F. CLAYTON, M. D.

My Father
Aesculapius, patron saint,
Bow down thine ear to my complaint;
Hear thou my prayer.

Give ear unto my plaintive moan;—
Hear me while I deeply groan,
In blank despair.

My patients all are getting well;
What I'm to do I cannot tell,
To make the coin.

My calling list is very short;
At night I have a light report,
As sure's you're born.

The best of health prevails around
The regions of my stamping ground,
So I am poor.

Though I have long upheld the cause,
And tried to study Nature's laws
With motives pure.

The undertaker won't divide;
So I am bound to have his hide
By curing all.

This makes me popular you know,
And so I often have to go
To make a call.

But half the work I've done to-day
Was for the folks that could not pay
A single cent.

And so I have to cure them quick,
Although I found them very sick
Where e'er I went.

And now I find my money scarce;
And honesty seems like a farce,
For me to play.

My patron saint, what shall I do
To keep my business full in view,
And make it pay.

Suppose you send some sickness down
Upon the people of this town,
And round about;

But don't you let them know I call
On you to help me in my thrall,
And lift me out;

Nor don't you let it hit the poor
That have not money, goods, nor store
To pay the bill,

For I have had enough of that;
It never makes a doctor fat
To cure or kill.

But send it like a little rain,
A headache or a little pain,
To homes of wealth.

I would take work of any kind,
Of the body or of the mind
To bring to health.

Typhoid fever is pretty good;
Malaria, or a lack of blood,
Or anything:

A broken bone I'd gladly take;
A simple cramp or stomach-ache
Would make me sing.

A few old women with their ills,
And lots of cash to pay their bills
Would suit me much.

I would stick to them to the end,
To every want I would attend
By sight or touch.

I'd gladly help to bring to light
New babes by either day or night,
No odds to me:

If their papa would but support
The dignity of such a court
With ample fee.

The whooping-cough and measles, too,
And other ailments not a few;
And ague chills,

I'd gladly take the children through,
And do the best a man could do,
For moderate bills.

But cholera, small-pox, and the itch,
You will please tumble in the ditch
Without my care.

Or send it to some other quack,
And don't you let him bring it back;
Though I've no fear.

And finally, my patron saint,
Give ear to this, my last complaint,
And hear me pray.

Send business that will pay the cash,
And see how I will cut and slash
To make it pay.

—*Keystone Medical Journal.*

THE WORKING SESSION.

The following will give the reader an idea what this part of the annual meeting of the Americun Society is:

Table No. 1.—Rev. J. T. Brownell, A. M., Auburn, N. Y. First hour—making sweat-proof wax cells for opaques. Second hour—Staining and mounting pollens.

Table No. 2.—Prof. J. T. Burrill, Ph. D,, F. R M. S., I. I. U., Champaign, Ill. First hour—Measuring the power of objectives. Second hour—Cultivating bacteria, flask method.

Table No. 4.—H. J. Detmers, M. D., F. R. M. S., Champaign, Ill. Mounting fresh animal tissues.

Table No. 6.—Prof. S. H. Gage, B. S., Cornell University, Ithaca, N. Y. Preparation of serial sections and staining them on the slide.

Table No. 7.—T. H. Hamlin, M. D., Auburn, N. Y. Mounting opaque objects in wooden cells.

Table No. 8.—Gen. Wm. Humphrey, Adrian, Mich. Cutting vegetable sections.

Table No. 9.—Prof J. E. Hyatt, Morrisania, N. Y. Showing multiple images in compound eyes of insects.

Table No. 10.—F. L. James, M. D., St. Louis, Mo. Silvering mirrors.

Table No. 12.—Prof. L. A. Lattimore, L L. D, Rochester, N. Y. Methods of separating from fluids, floating, suspended, or sedimentar. substances for microscopic examination.

Table No. 13.—Jos. Levi, Esq., Rochester, N. Y. Making wax cells for transparent and opaque objects.

Table No. 16 —Prof. Henry Mills, Buffalo, N. Y. How to prepare sponges for mounting spicules.

Table No. 17.—A. C. Mercer, M. D., F. R. M. S., Syracuse, N. Y. Section cutting with freezing microtome.

Table No. 19.—Wm. Rebaz, Rochester, N. Y. Making cells of shellac varnish.

Table No. 22.—Prof. C. H. Stowell, M. D., F. R. M. S., Ann Arbor. Counting blood corpuscles. Mrs. Louisa R. Stowell, M. S., Ann Arbor. Showing circulation of protoplasm in the vegetable kingdom.

Table No. 23.—J. O. Stillson, A. M., M. D., Indianapolis. Preparing and mounting insects.

Table No. 25.—Chas. Shepard, M. D., Grand Rapids, Mich. Mounting mineral specimens.

Table No. 27.—Prof. W. J. White, Kalamazoo, Mich. Transferring microphotographs from charms to slides.

Table No. 28.—E. J. Whitney, Rochester, N. Y. Rapid mounting of opaque objects.

SCIENTIFIC FALLACIES.

We believe it was old Dr. Johnson who said, "Let any fool, preaching no matter how absurd a doctrine, address a crowd at the street corner, and he will be sure to find some disciples."

So it seems to be to-day in the world of science. Any one who claims to have made a discovery, and on the strength of it brings out a novel theory, immediately finds a train of disciples drawn from the crowd of those who, like the Athenians of yore, are ever anxious to see and hear some new thing.

An instance in point is Dr. Koch's famous bacillous theory.

With it he captured the scientific world as one captures a gudgeon with a fly. What is the result? Where is the theory after two or three short years of testing? Does any one now advocate the existence of a tubercle microbe as a factor of any consequence, either in the treatment or in the prophylaxis of the disease? So it was some years ago, when fevers of all kinds were dosed with enormous quantities of alcoholics on some general theory of fever.

Most of these ephemeral doctrines arise from the study of physiological therapeutics, from an unhesitating acceptance of the teachings that the only true basis of a rational pharmacy is in experiments on lower animals and on persons in health.

The fallacy of such a doctrine has been so often demonstrated that it is useless again to refer to it. Yet it cannot too often be repeated. We can only learn disease from disease. Pathology is not physiology, and is not akin to it. As Virchow has often and ably urged, it is incorrect to make any suppositions about the former from the latter. Their laws and their processes are different.

So it must also be with the effect of various agents. If we wish to learn their effect on disease in man, we must study them in disease in man, and not elsewhere.—*Editorial in the Philadelphia Medical and Surgical Reporter.*

BACTERIA IN BLOOD.

Mr. Dowdeswell read a paper "On some Appearances in the Blood of Vertebrated Animals with reference to the occurrence of Bacteria therein," before the Royal Society of London. He states that the small red corpuscles known as "Schultze's corpuscles," have undoubtedly been mistaken for bacteria, "as obviously is the case in the recent report of one of the most important investigations of the day."

Again he says that certain bud-like processes on the surface of the red corpuscles, first described by Addison and since called "Addison's processes," have been many times described as bacteria. "Indeed morphologically they are indistinguishable from them."

"In the report of the French Cholera Commission in Egypt

these processes are mentioned. They doubtless occur in many pathological conditions."

In commenting on the paper Prof. Bell said that Dr. Timothy Lewis who had been making some operations in India, opened a dog and removed its two kidneys; one was placed directly into warm paraffin and left to cool, and the other was examined at once; the latter was found to contain no bacteria, but the one which had been put into the paraffin was found to be swarming with them. This fact had not been referred to by those who were at present examining into the nature of cholera germs, but he thought it contained a moral which applied to all forms of disease.

Mr. Beck considered the question to be an extremely interesting one. If what the Secretary had said—that the bacteria were the result and not the cause of the disease—was well founded, the same might apply to other diseases.

The President thought it was not Mr. Dowdeswell's intention to say that there were disintegrated corpuscles, but that there were pseudo-bacteria. In the case of splenic fever the specific forms had been seen, and it had been not only proved that when introduced into the system they would give rise to the disease, but that when they had been filtered out the disease could not be so communicated, so that it was clear in this case that the bacteria were the absolute cause and not the result of the disease.

THE SECTION OF HISTOLOGY AND MICROSCOPY AT PHILADELPHIA.

PROFESSOR T. G. WORMLEY, PRESIDENT.

Alexis A. Julien read a paper on an immersion apparatus for the determination of the temperature of the critical point in the fluid cavities of minerals. The author described a new device for raising a thin section of a mineral, mounted on a glass slide, to an accuratety determinable temperature upon the stage of the microscope. The arrangement consists of a thin walled box heated by conduction from a taper through the copper plate which forms its bottom, and which projects beyond the stage. The thermometer has a scale ranging from 22° to 45° C.; each

degree on the scale being two centimetres in length and divided into tenths. The bore and length are so arranged as to bring that part of the scale near 30° on a level with the eye of the eye-piece, in order to facilitate quick readings without moving the head. The box serves as a water bath in which any objective from one-half to one-tenth may be immersed without serious loss to the objective's optical capacity. The critical point of the fluid may be readily determined in ten minutes by both the disappearance and reappearance of the bubble within a twentieth of a degree.

Prof. Henry F. Osborn's paper upon a microscopic method of studying the amphibian brain was valuable. The brain is hardened in "Müller's fluid," the ventricles being fully injected. After the usual alcoholic treatment, the brain is placed for one week in a carmine solution, then for twenty-four hours in acetic acid. The embedding mass is prepared by shaking the contents of an egg with three drops of glycerine. After soaking in this mass, the brain is placed in this position and hardened in the vapor of boiling eighty per cent. alcohol. The mass is then placed for one week in absolute alcohol. Serial sections are then made under alcohol with a microtome. The sections are then arranged on the slide and covered with blotting paper, and treated with alcohol and oil of cloves through the blotting paper.

Dr. H. G. Beyer reported one of his observations made during his still uncompleted researches on Lingula. In his abstract he says: "One of the points that I should like to demonstrate from one of my sections is a probable communication of the so-called segmental tubes with one of the diverticula (liver) of the alimentary canal of the animal, by means of a convoluted tubule."

Dr. R. H. Ward described a couple of neat contrivances—one, a new illuminating arrangement called the iris illuminator; the other a long-armed lens-holder. Professor William A. Rogers gave a description of the various steps by which a centimetre or an inch may be produced from a standard metre or a standard yard respectively.

The last two have already been noticed in the report of the American Society of Microscopists.

Notice the new ads in this number on pages I and VII.

By sending one dollar now, all new subscribers will receive the JOURNAL for the remainder of this year and all of 1885.

The third edition of our Manual of Histology is just from the press. The work has been entirely rewritten, greatly enlarged, and newly illustrated. The price is $3.50.

Parties remitting four dollars will receive the work postpaid and this journal until January, 1886.

A prospectus will be sent to all who desire it.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge).

HISTOLOGICAL and Pathological slides to exchange for other good slides. F. F. COLWELL, Urbana, Ohio.

FRESH-WATER ALGÆ, nearly all genera, and many beautiful varieties; also euglena, astasia, etc., for good pathological or other interesting slides. Lists exchanged. J. M. ADAMS, Watertown, N. Y.

WOULD like to exchange a $\frac{1}{6}$ Bausch & Lomb patent adjustment (glycerine front) objective, almost new, for a $\frac{1}{4}$ of moderate angle, C. B. HIGBY, Mokelumne Hill, Cal. Co., California.

I HAVE a first-class black glass rotating stage, with sliding object carrier kept down by ivory pointed screw. Will exchange for a low power objective, works on microscopy, or first class mounted objects, HAROLD PLOWE, 136 High St., Peoria, Ill,

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WANTED.—Diatoms on Algæ, from the Sandwich Islands, Californian coast, and other tropical sea coasts. Will give in exchange either very good mounted micro-slides or cash for good material. J. C. PRINNBOCH, 14 Simmering, Wien, Austria.

FOR SALE.—A copy of Prof. Leidy's great work on the Rhizopods has been left at this office for sale. Price $7.50 C. H. STOWELL.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

HISTOLOGICAL mounts to exchange for other good slides. T. B. STOWELL, Ph. D., Cortland, N. Y.

GUNDLACH'S adjustable 1-5 objective, 135° aperture, for sale. Dr. A. C. Stokes, Trenton, N. J.

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossi Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore case of Fern too numerous to mention, to exchange for well mounted objects WM. FARNELL, Macon, Ga.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc. W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

FOR SALE,—Slides, double stained, of Bacillus Tuberculosis, 50c. each. DR. W. R. CHITTICK, 83 Lafayette Avenue, Detroit, Mich.

WANTED.—Books treating on microscopical and histological subjects not already in my possession. Will pay cash or give slides in exchange. State name of the work, date of issue, and price. C. H. STOWELL, Ann Arbor, Mich.

WILL Exchange mounts of stained vegetable sections for other mounts of interest. MRS. L. R. LOOMIS, Ann Arbor, Mich.

AMPHIPLEURA PELLUCIDA or any other test diatom mounted in the new medium having refractive index of 2.4 can be procured from H. H. CHASE, M. D., Geneva, N. Y.

SECTIONS of bone of cat, and purcupine quill, seed of Papara somniferum and Lychnis githago, eye spots and pieces of wings of Attiacus cebropia and promethens, etc., for other good slides. HOWARD N. LYON, 80 South St., Auburn, N. Y.

I WILL send a quantity of good diatomaceous material containing Bacillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Euglena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

WILL Exchange mounted slides of various crystals, diatoms, in situ, stellate hairs of plants and micio fungi, for other good slides or material. JAMES E. WHITNEY, Rochester, N. Y.

PATHOLOGICAL, Histological and other well mounted slides will be exchanged for mounted specimens of interest. Lists furnished on application. D. E. HAAG, M. D., Liberty Center, Henry County, Ohio.

WOULD like to exchange a 1-6 objective, 160°, adjustable, for a lower power. A. Y. MOORE, 89 Prospect street, Cleveland, Ohio.

EXCHANGE.—I have a large number of vegetable mounts, single and double staining. Would like to exchange for any specimens of interest. MISS L. M. BERKEY, Grand Rapids, Mich.

THE MONTHLY
MICROSCOPE
ILLUSTRATED.

VOL. IV. ANN ARBOR, NOVEMBER, 1884. No. 11.
WHOLE NO. 28.

Original Communications.

A BEAUTIFUL SLIDE.

A VERY beautiful polariscope slide may be made as follows: Heat a slide until it will melt a small portion of a menthol pencil as it is drawn evenly back and forth over a perfectly clean surface. Do not use more heat than necessary to melt the material evenly. Then, as it commences to crystallize, arrest its progress frequently by passing the slide quickly over the flame of your spirit lamp; soon the crystallization will be completed, a little at a time, and a very desirable slide will be the result. E. H. G.

IDENTIFICATION OF BLOOD CORPUSCLES.

M. D. EWELL. M. D., EVANSTON, ILL.

THE gentlemen who from time to time favor your readers with communications respecting the identification of blood corpuscles, a subject of great interest, would, as it seems to me, render their observations of more scientific value if they would

at the same time favor their readers with their methods of measurement, stating what objectives, eye-pieces, length of tubes, stage or eye-piece micrometers they use. This statement need occupy but little space, and would enable those interested in that subject to form a more correct judgment as to the reliability of published results.

There are many who are working earnestly on this subject, and we desire all the light we can get. May I ask your correspondents to give us their methods of work? I desire to ask also if the blood corpuscles shrink in size by mounting them dry?

THE WORKING DEPARTMENT.

MANY thanks for your kind words in the October number of your journal. I certainly appreciated the unanimous vote of the A. S. M. at our last annual meeting, but circumstances positively forbid my acceptance of the directorship of the Working Department next year; besides, I am not an advocate of third terms. If there is any honor in the office, let others share it; if it is a great tax in time and in money, let others help bear it.

I am a firm believer in practical work rather than in theory in all the departments of life, and I am fully convinced that much of the future success of the A. S. M. will depend on the success of its Working Department. I trust that no member of the Society, one or more of whom I meet in my travels nearly every day of the year, will accuse me of disloyalty to its best interests because of my refusal to serve. If the Department has been a success thus far, most of the credit is due to the experts who so kindly came long distances, paying their own expenses and furnishing their own material to teach others, free, what cost them years of time and much money to learn. It may be unknown to the members that the valuable practical papers written by Rev. J. T. Brownell, Profs. H. Gage, F. L. James, M. D., Geo. Duffield, M. D., and by several others, were written expressly for the Working Department, and that many in attendance came expressly to learn methods by seeing the actual work which the papers described. Our honored member from Elmira, Dr. Gleason, expressed the views of the majority

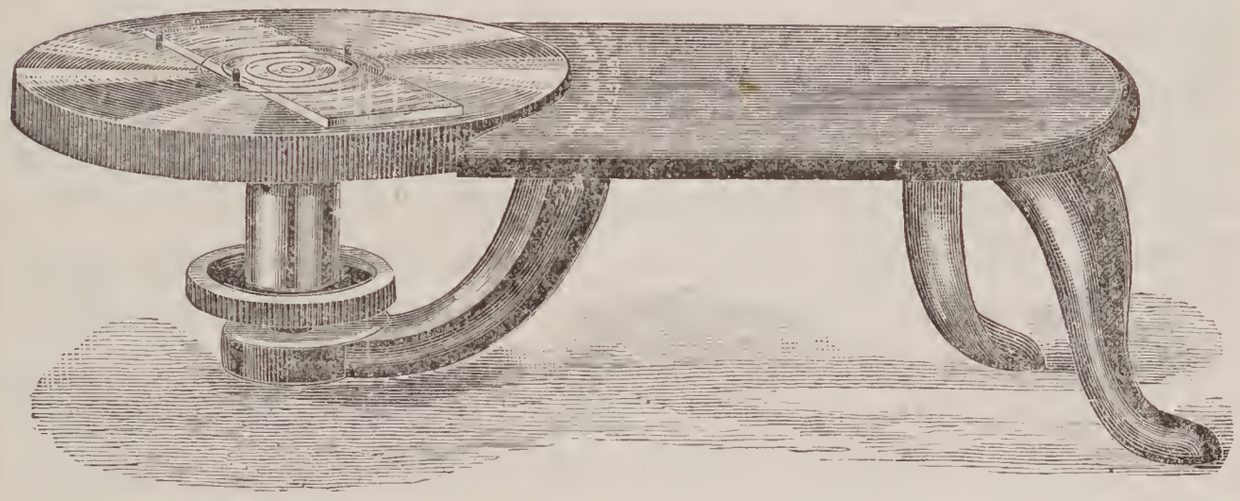
when he said that Theory and Practice should be united in our meetings.

I am convinced that it is the intention of the Executive Committee to appoint a director of the Department more competent than I could possibly be under the circumstances, and if so, he shall have my hearty support. Let us be united in our good work, for "in union there is strength."

E. H. GRIFFITH.

FAIRPORT, N. Y.

GRIFFITH'S TURN TABLE.



A partially revolving disk is fitted into the center of the table. On the surface of the disk are two projecting studs. The slide is placed between the two pins and partially rotated against the spring, at the same time being pushed forward against a stop. The spring holds the slide firmly against a fourth pin. This arrangement is quick in its action and not liable to get out of order.

HINTS ON TECHNIQUE.

ONE of the most important things for the student of biology is an improved technique in his microscopical work, and every point which aids him in this line is a positive gain. The writer hopes that the hints here presented may help others over some of the points which sometimes prove stumbling blocks.

One of the greatest advantages of fastening sections to the

slide lies in the ease with which they are stained, and another is that no matter how delicate or how complicated, every section and every part of a section is forced to occupy its proper place and all chances of disarrangement of parts entirely disappear. Sections are covered far more readily and more evenly on the slide than is the same tissue in the mass, and when one by practice becomes familiar with the technique he has no desire to return to the flesh pots of Egypt. To be sure the steps are rather numerous but when one has mastered them they come like second nature. There is a philosophy in all microscopic work and as soon as one understands why each step is taken, the whole is clear as day.

In mounting sections on the slide by the collodion method I have found it most convenient to coat a large number of the slides at the same time with collodion and afterward as required for use to paint the spot which the sections are to occupy with oil of clove. The other method paints the slides as wanted with a mixture of clove oil and collodion. In applying the collodion a glass rod is the most convenient instrument and it should be passed but once over the slide.

Unless considerable care is taken the collodion method will not work satisfactorily in all cases and for this reason: Not infrequently one gets on too much oil of clove and then the sections float out of their proper position. This of course can only be avoided by using just enough oil of clove to render the collodion sticky and not enough to make it fluid. Even then when dissolving away the paraffin with turpentine one will occasionally be annoyed by having some of his sections float away. The cause is not far to seek. The slide was not left long enough on the water bath and hence a little of the clove oil still remains. They should be kept at an elevated temperature until not the slightest odor of the oil can be recognized. Then all will be safe.

In the lac method of fastening the sections one frequently has difficulty in dissolving the lac. Freshly bleached lac is required and it should be bleached in the sun and not by chemicals as is now the practice. In case the lac becomes old it need not all be thrown away for on breaking open the lumps the interior will be found suitable for use. It should be dissolved in

absolute alchohol.* It will not be possible to dissolve all the lac, and after standing a few days the supernatant fluid should be decanted and the sediment thrown away. In my early days with lac I found great difficulty in getting a clear, transparent coating on the slide and was about ready to discard the process in disgust, but I found that on heating the slide to say about 150° F. the coating could be applied with perfect success every time. It should be applied with a glass rod the same as collodion.

Creosote is not used as extensively as a clearing medium as it deserves to be. It has one excellent advantage which is lacking in clove oil and that is that it will dissolve a certain proportion of water. Hence it is possible to clear a slide without the use of absolute alcohol. The steps are the same as with oil of clove. The only objection which I have found with its use is its disagreeable smell. It mixes perfectly with balsam.

One of the bits of technique which has given me the most satisfaction is the recent one of overstaining and then withdrawing most of the color. It is just splendid for nuclei. After the sections are fastened to the slide and the paraffin is dissolved away by turpentine, I place it in a bottle of alcohol to remove the turpentine. It is then ready for staining. It is placed in a bottle of the desired stain and allowed to remain for a considerale time, far longer than is usually the case. After the lapse of from half an hour with hæmatoxylin to two or three days with some of the carmines, the slide is ready for the next operation. It is now overstained. The problem is to dispose of some of the superfluous color. This is accomplished by placing it in a bottle of alcohol acidulated with a few drops of hydrochloric acid, say about ten to the pint. Here it remains until the sections are appreciably light, and is then washed with pure alcohol and is then mounted in the usual manner.

In keeping my section knives when not in use I have adopted a very simple expedient. I make a longitudinal deep saw scarf in a block of wood and in this the edge of the knife is

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* A contemporary recently said that when microscopists say "absolute alcohol" they mean ninetv-five per cent. spirit. With all due deference to the author quoted we should say that they mean nothing of the kind, and in most microscopical operations ninety-five per cent. alcohol will not do in the place of absolute.

placed. The proportions of the slit should be such that the middle of the knife should rest on the edges of the cut while the cutting edge does not reach the bottom.

APERTURE AND WORKING DISTANCE.

BY E. GUNDLACH.

THE aperture of a lens magnifier or objective, is its actual diameter; but, only the proportion of the diameter to the focal length is optically of importance. This proportion is given by the so-called *angular* aperture of the lens; the radius of the actual aperture being the *sine* of one-half the angle of aperture if the focal length be the radius of said angle. Working distance is the distance between the object and the lens when in focus. If the lens were without thickness, then its focal length would be its working distance. But this can only be admitted to be practically true for glasses of comparatively small angular aperture. A lens of ten inches focal length and one inch diameter will form an image of a remote object at ten inches distance from the lens. So its working distance is ten inches or equal to its focal length. Now, suppose the lens is desired to be of 90° angular aperture. To make this plain we will suppose further, that the lens is without thickness and plane; then its working distance would not be reduced by its increased diameter, which would then have to be 20 inches. If we take a step further and increase the angular aperture of the hypothetical lens to 170° it would then require a diameter of 228.6 inches, or, twice the tangent of one-half the angle of aperture, the focal length of the lens being the radius of the angle. But, fortunately the proper form of the equivalent of an objective is not a plane, but a segment of a sphere, having its center in the focus of the objective. Consequently, the radius of its clear aperture is equal to the *sine* of one-half the angle of aperture, the focal length being the radius. Thus the diameter of a ten inch lens of 170° aperture, spherically formed, will be only 19.9 inches. But this spherical shape reduces the working distance considerably, because it brings the edge of the lens so much nearer the plane of the object. Hence, a lens or objective will have a proportionately shorter working distance the greater the

angular aperture. The working distance of an objective is the *cosine* of one half its angular aperture, the focal length being the radius of said angle; that is, supposing the lens to be without thickness at the edge at least. According to this the working distance of the hypothetical 10 inch lens of 170° will be less than $\frac{9}{10}$ of an inch. A $\frac{1}{10}$ objective of 170°, presumably of no thickness, would have less than $\frac{8}{1000}$ of an inch working distance. In this way the—practically impossible—maximum working distance of any objective can be found by calculation from the following formula:

$$F \cos A = W.$$

F being the equivalent focal length; A, one-half the angle of aperture; W, the working distance. But, since objectives, to be of sufficient angular aperture, have to be of considerable thickness, the real working distance can only be a comparatively small part of the theoretical maximum. Therefore, the determination of the theoretical maximum working distance of an objective of certain focal length and angular aperture can only serve to find what part of said maximum the real working distance is. Indeed, the estimation of the quality of an objective, in regard to working distance, should always in the first place relate to the proportion of its real working distance to the theoretical maximum. (And the angular aperture should always be determined for the medium through which the objective works.) To determine this proportion by a number, the unit of which, to be the theoretical maximum working distance, the following formula will serve:

$$V = \frac{B}{F \cos A.}$$

V, being the proportion of the real working distance to the unit; B, the real working distance; F, the equivalent focal length; A, one-half the angle of aperture.

If the different kinds of objectives are compared according to the above principle it will be found that the dry working, and, to some extent, the water immersion objectives of wide angle are most generally of extremely short comparative working distance; far shorter than the thickness of the system can account for. The reason of this is, that the front lens is much

thicker than is required by the angular aperture. This is done mostly to obtain a higher degree of correction of the spherical aberration; the increased thickness of the front lens working the same as an immersion medium. Therefore the optical performance, especially of the resolving power of a dry working or water immersion objective, is to be regarded as directly proportionate, not only to its angular aperture but also to its relative working distance. Hence, if two objectives are equal in focal length as well as angular aperture but different in working distance only, the one with the shorter working distance ought to do correspondingly more than the other.

AN UNUSUAL INFUSORIAN OF THE FAMILY VORTICELLIDÆ.

D. S. KELLICOTT, BUFFALO, N. Y.

SCAJAQUADA CREEK, after flowing westward ten or twelve miles through rich farming lands and the north-east part of the city of Buffalo, passes through Forest Lawn cemetery into Park Lake; about a mile below the lake it enters the Erie canal at Black Rock. Like most streams through populous districts, it has more or less the character of an open sewer. Park Lake, fed by this stream, is an artificial pond in the beautiful and extensive public park of Buffalo. By reflection, one may readily perceive that its water is not quite limpid and wholesome, not as nearly so as it should be in a boating resort, and that the combination giving sewer and cemetery contamination to the park water is one not to be recommended. The creek below the park is wide and deeper than it is above the same; the construction of the canal having changed its former outlet into the Niagara River and raised considerably its level, so that it now fills its ancient excavation in the drift-clay. The numerous stumps of trees still standing in the water attest the changes of level made nearly seventy years since by "Clinton's Ditch."

As the contaminated water of the creek spreads out in the broader, quiet lake and slowly moving stream, its organic matter is rapidly separated by settling and decomposed by bacteria,

other fungi, and small animal life. That it is a pretty likely place to find Infusoria need not be said, and just what, in the nature of the case, one would suspect proves true on examination. No body of fresh water known to me so teems with microscopic species of life as does this artificial lake, and especially the broad, sluggish creek from the pond to the canal. Algæ, rhizopods, infusorians, sponges, rotifers and polyzoans abound in profusion, both of species and of individuals. The Polyzoa thus far identified are as follows: *Fredericella regina*, *Plumatella diffusa*, *P. arathusa*, and *Cristatella ophidioidea*. The following sponges have been found by Mr. Henry Mills: *Spongilla fragilis*, *Meyenia lacustris*, var. *asperima*, *Carterius latitenta*, and *C. tubisperma*.

It is not possible to give a catalogue of the innumerable species of Infusoria, nor does it seem worth while, at present, to mention such as have been identified. It is but a short time since attention was directed hither, yet many striking and remarkable forms have been revealed. Scajaquada Creek is an infusorial elysium. Recent trips to its borders have been rewarded by the discovery of a unique species of the vorticellidan genus *Opercularia*, which I have described elsewhere ("Proceedings Am. Soc. of Mic.," vi.–119,) as *O. rugosa*. It is characterized mainly by its very stout, rugose, branching pedicle, with the numerous zooids in spheroidal clusters at the summits of the branches. The species whose characters are recounted below is not less unusual; it is one that may easily interest any one, specialist, student or layman.

Sept. 20, 1884, on placing a fragment of *Anacharis Canadensis*, taken from the creek and bearing a large colony of *Epistylis flavicans*, in a tube-vial, and examining with a hand lens I was easily able to separate a group as strangers to me. The colony stock was tall and wide spreading, equaling .13 of an inch in height, and bore scores of animalcules; these, again, were so large that they were plainly visible to the unaided eye, whilst the simple magnifier disclosed their movements, their elegant proportions, and the beautiful iridescence of the pedicle. By continuing the search other colonies were secured, and it was soon proven that the spreading minute trees with their animate fruit were not at all uncommon. The first glance un-

der the compound microscope revealed the fact that the form was an unusual one of the family Vorticellidæ. The characters that first attracted attention were the very large size both of animalcules and colonies, and the two very distinct types of zooids; one long, slender, snake-like, the other shorter, stouter, and trumpet-shaped, while both sorts possess peristomes reminding one of the open mouth of an ophidian.

If it may be allowed to compare small things with great, an appropriate specific name for this infusorian which, it appears, has not been hitherto named, is that suggested by the above characters of resemblance; hence, the name proposed below alludes to the form and motions of the elongate type, as well as to the peristomal figure of both types.

Epistylis ophidioidea, n. s. Animalcules of two forms, or types.

First or ordinary zooids, trumpet-shaped, with the peristomal region oblique, its width equal to or a little less than one-half the length of the body, and in one view concave, resembling in this respect the peristome of *Carchesium polypinum.*

Fig. 1.

Fig. 2.

The attenuate posterior third of the body is not so densely filled with granules as the upper two thirds, and is delicately striate longitudinally, whilst the anterior portion, which is filled with fine grunular endoplasm and a few large spheroidal bodies, is obscurely transversely striate. The peristome border is thickened cord-like; the vestibular and opposite edges are prominent, thus giving, when extended, the appearance of an open

reptilian mouth; along the vestibular part of the peristome there are usually numerous clear, large corpuscles. The ciliary disc is also concave like the border, and raised ridge-like through the middle from vestibulum to opposite edge. Contractile vesicle large, pulsating slowly. Endoplast long, linear, extending from the peristomal region down to the attenuate posterior third of body, more or less curved. Length of body $\frac{1}{90}$ to $\frac{1}{60}$ of an inch.

Second or specialized or reproductive type, snake-like; length $\frac{1}{145}$ to $\frac{1}{37}$ of an inch; width about one-tenth of the entire length; width of peristome less than in the first form, but similar in other particulars; the clear globules about the peristomal border are rather more constant and prominent than in the other stage. The contractile vesicle and contents of the body are similar, while the cuticular surface is more distinctly marked, the transverse striæ on the upper part of animalcule being quite distinct. Endoplast much lengthened, spirally disposed, readily changing its position in the endoplasm.

The body is often bent in the shape of the letter S or flexed into a sharp angle at the middle bringing the anterior extremity to the level of the posterior. The number of elongate zooids is about one to twenty of the ordinary type.

The long, slender, brown pedicle is dichotomously and profusely branched; its surface finely striate lengthwise and articulate. The height of the largest dendrecia equals $\frac{1}{6}$ of an inch. Scajaquda creek, Buffalo, N. Y., and Ischua creek, Franklinville, N. Y.

I am justified, I think, in speaking of this vorticellid as a remarkable one. Its size equals or exceeds that of any of its group. The peculiar motions of its peculiar peristome, also, at once attract attention. The edges of the same are often bent over, with the disc, lip-like or folded in like shutting ones hand. The normal form on contraction wholly infolds the peristomal region becoming somewhat pyriform in outline; those of the second type withdraw the same but do not very much shorten their bodies.

This species should be compared with *Epistylis galea*. It resembles this species in the clear posterior third; the ordinary animalcules agree somewhat in form although *Ophidioidea*

appears to be much larger and stouter than *Galea*, judging by the figures of the latter in Kent's *Manual of the Infusoria*, plate 39, Fig. 6, and this expression in the diagnosis: "About three times as long as broad." The zoodendrium of our form is articulate like that of *Galea* but is not "relatively short [and] thick" as in that species; on the contrary, it is relatively slender and one of the tallest known. The cuticular surface is not smooth, but striate, and the vestibular entrance *does not project snout-like.*

Concerning the significance of the two forms my observations add nothing to what appears in the manuals relating to other genera. No other species of *Epistylis* has been observed to possess such marked differences in the character of individuals among the clusters. At first I inclined to the opinion that on this account it was generically distinct and *Heteroepistylis* occurred to me as a fitting name, but I remembered that *Zoothamnium* was separated from *Carchesium* on similar grounds, but that its present validity rests upon an entirely different character, viz: that of the muscular fibrilla of the pedicle rather than upon the polymorphism of the zooids; moreover, the relation of the two forms is an unsolved problem. It appears to relate to the genetic reproduction of the species.

A similar modification has been recorded as occurring in *Zoothamnium alternans* by W. S. Kent, *Manual of the Infusoria*, page 696. He remarks as follows: "It is anticipated by the author that these attenuated zooids represent male units destined to compass genetic union with the large subspherical and subsequently detatched animalcules of the normal colony stock. Phenomena substantiating this anticipation have yet to be recorded; even should this not be forthcoming *Z. alternans* will afford one of the most remarkable known instances of polymorphism among Infusoria, in no other type being there three distinctly differentiated zooidal forms." I have not discovered what was taken to be a third form or one to agree with the "large subspherical animalcules of *Z. alternans*;" on the other hand, those occur which I have called intermediate between the two described above.

During September and October many groups were examined and in no case of colonies of more than a few zooids were

the elongated individuals found wanting. The pedicle bearing these is enlarged or capitate at the summit, not so in the other or normal type.

Explanation of the figures:

1, represents a normal zooid.

2, represents an elongate zooid with the capitate termination of the pedicle. The figure was drawn after an individual relatively shorter than the average of its type.

On page 221, in the October number, the last paragraph should be corrected to read, "If the human corpuscle will, *dried*," etc.

D. S. Harris, of Cuba, Ill., writes that he has examined the diaphragms of over 100 rats and found encisted trichinæ in them all.

We are obliged to make the sad announcement of the death of Mr. L. R. Sexton, of Rochester, N. Y. Mr. Sexton was the sole agent for some years for all of the works of Mr. Gundlach.

MR. GRIFFITH'S RESIGNATION.—Practical microscopists all over the Union, but more especially the members of the American Society who live in the region regularly visited by Mr. E. H. Griffith, will learn with regret that he persists in his refusal of the superintendency of the working department of the society. Without wishing to detract from the services of any other person, we say that to Mr. Griffith, more than any other individual or set of individuals, is due the almost phenomenal success of the society, and his refusal of the office is to be viewed in the light of a misfortune amounting almost to a calamity. The originator of the department, he has by his constant, almost daily, intercourse with practical microscopists, all over the land, made it the most valuable feature in the annual gatherings of the society. To our certain knowledge, to him and his personal solicitations are due a large proportion of the papers of a practical nature presented at the last meeting, to say nothing of the numbers of members who have joined the society upon his representation and recommendation.—*National Druggist.*

Selections.

LOWEST AND SMALLEST FORMS OF LIFE AS REVEALED BY THE MODERN MICROSCOPE.

The following are some of the principal passages of a lecture delivered by Rev. Dr. W. H. Dallinger, at the Montreal meeting of the British Association. The Times says of it, "But, perhaps, the most popular and generally instructive feature in connection with biology at Montreal was the address of Dr. Dallinger, in which he exhibited by word and picture the wonderful revelation of the lowest forms of life made by the modern Microscope; and in which he showed that however easy it may seem to generate life in the proper conditions, no one has ever yet succeeded in producing spontaneous generation. And here Dr. Dallinger is in accord with the most competent scientific opinion."

Dr. Dallinger said:—"The labor, enthusiasm, and perseverance of thirty years, stimulated by the insight of a rare and master mind, and aided by lenses of steadily advancing perfection, has enabled the student of life-forms not simply to become possessed of an inconceivably broader, deeper, and truer knowledge of the great world of visible life, of which he himself is a factor, but also to open up and penetrate into a world of minute living things so ultimately little that we cannot adequately conceive them, which are, nevertheless, perfect in their adaptations and wonderful in their histories. These organisms, while they are the least, are also the lowest in nature, and are totally devoid of what is known as organic structure, even when scrutinized with our most powerful and perfect lenses. Now, these organisms lie on the very verge and margin of the vast area of what we know as living. They possess the essential properties of life, but in their most initial state. And their numberless billions springing every moment into existence wherever putresence appeared, led to the question, How do they originate?—do they spring up *de novo* from the highest point on the area of not life which they touch? Are they, in short, the direct product of some yet uncorrelated force in na-

ture, changing the dead, the unorganized, and not-living into definite forms of life?

Now, this is a profound question, and that it is a difficult one there can be no doubt. But that it is a question for our laboratories is certain. And after careful and prolonged experiment and research, the legitimate question to be asked is: Do we find that in our laboratories and in the obscured processes of nature now that the not-living can be, without the intervention of living things, changed into that which lives? To that question the vast majority of practical biologists answer without hesitancy, 'No, we have no facts to justify such a conclusion.' Professor Huxley shall represent them. He says: 'The properties of living matter distinguish it from all other kinds of things:' and he continues, 'the present state of our knowledge furnishes us with no link between living and the not living.' Now let us carefully remember that the great doctrine of Charles Darwin has furnished biology with a magnificent generalization—one, indeed, which stands upon so broad a basis that great masses of detail and many needful interlocking facts are of necessity relegated to the quiet workers of the present and the earnest laborers of the years to come. But it is a doctrine which cannot be shaken. The constant and universal action of variation, the struggle for existence, and the 'survival of the fittest,' few who are competent to grasp will have the temerity to doubt. And to many, that which lies within it as a doctrine and forms the fibre of its fabric, is the existence of a continuity, an unbroken stream of unity running from the base to the apex of the entire organic series. The plant and the animal, the lowliest organized and the most complex, the minutest and the largest, are related to each other so as to constitute one majestic organic whole. Now, to this splendid continuity practical biology presents no adverse fact. All our most recent and most accurate knowledge confirms it.

But the question is—Does this continuity terminate now in the living series, and is there then a break—a sharp, clear discontinuity, and beyond another realm immeasurably less endowed, known as the realm of Not-life? Or, does what has been taken as the clear-cut boundary of the vital area, when more deeply searched, reveal the presence of a force at present

unknown, which changes not-living into the living, and thus makes all nature an unbroken sequence and a continuous whole? That this is a great question, a question involving large issues, will be seen by all who have familiarized themselves with the thought and fact of our times. But we must treat it purely as a question of science; it is not a question of how life first appeared upon the earth, it is only a question of whether there is any natural force now at work building not-living matter into living forms. Nor have we to determine whether or not, in the indefinite past, the not-vital elements on the earth, at some point of their highest activity, were endowed with or became possessed of the properties of life. On that subject there is no doubt. The elements that compose protoplasm—the physical basis of all living things—are the familiar elements of the world without life. The mystery of life is not in the elements that compose the vital stuff. We know them all; we know their properties. The mystery consists solely in how these elements can be so combined as to acquire the transcendant properties of life. Moreover, to the investigator it is not a question of by what means matter dead—without the shimmer of a vital quality—became either slowly or suddenly possessed of the properties of life. Enough for us to know that whatever the power that wrought the change, that power was competent, as the issue proves. But that which calm and patient research has to determine is, whether matter demonstrably not living can be, without the aid of organisms already living, endowed with the properties of life.

Judged of hastily and apart from the facts, it may appear to some minds that an origin of life from not-life, by sheer physical law, would be a great philosophical gain, an indefinitely strong support of the doctrine of evolution. If this were so, and indeed so far as it is believed to be so, it would speak volumes in favor of the spirit of science pervading our age. For although the vast majority of biologists in Europe and America accept the doctrine of evolution, they are almost unanimous in their refusal to accept, as in any sense competent, the reputed evidence of 'spontaneous generation,' which demonstrates at least, that what is sought by our leaders in science is not the mere support of hypotheses, cherished though they may be, but

the truth, the uncolored truth, from nature. But it must be remembered that the present existence of what has been called 'spontaneous generation,' the origin of life *de novo* to-day by physical law, is by no means required by the doctrine of evolution. Prof. Huxley, for example, says, 'If all living beings have been evolved from pre-existing forms of life, it is enough that a single particle of protoplasm should once have appeared upon the globe, as the result of no matter what agency; any further independent formation of protoplasm would be sheer waste.' And why? we may ask. Because one of the most marvelous and unique properties of protoplasm, and the living forms built out of it, is the power to multiply indefinitely and forever!

What need, then, of spontaneous generation? A locomotive on a great journey, that is specifically endowed with the power to generate its own steam, surely does not need stationary engines placed all along the line to generate steam for it. It is certainly true that evidence has been adduced purporting to support, if not establish, the origin in dead matter of the least and lowest forms of life. But it evinces no prejudice to say it is inefficient. For a moment study the facts. The organisms which were used to test the point at issue were those known as septic. The vast majority of these are inexpressibly minute. The smallest of them, indeed, is so small that 50 millions of them, if laid in order, would only fill the one-hundredth part of a cubic inch. Many are relatively larger, but all are supremely minute. Now, these organisms are universally present in enormous numbers, and ever rapidly increasing—in all moist putrefaction over the surface of the globe." Referring to an experiment made with a few shreds of fish muscle and brain in pure water, and which in a brief time gave rise to a multitude of many living and moving organisms, Dr. Dallinger asked, "How did these organisms arise? The water was pure; they were not discoverable in the fresh muscle of fish. Yet in a dozen hours the vessel of water is peopled with hosts of individual forms which no mathematics could number! How did they arise—from universally diffused eggs, or from the direct physical change of dead matter into living forms?

Twelve years ago the life-histories of these forms were un-

known. We did not know biologically how they developed. And yet with this great deficiency it was considered by some that their mode of origin could be determined by heat experiments on the adult forms. Roughly the method was this. It was assumed that nothing vital could resist the boiling point of water. Fluids containing full grown organisms in enormous multitudes, chiefly bacteria, were placed in flasks, and boiled for from 5 to 10 minutes. While they were boiling the necks of the flasks were hermetically closed, and the flask was allowed to remain unopened for various periods. The reasoning was: Boiling has killed all forms of vitality in the flask. By the hermetically sealing nothing living can gain subsequent access to the fluid; therefore, if living organisms do appear when the flask is opened, they must have arisen in the dead matter *de novo* by spontaneous generation. But if they do never so arise the probability is that they originate in spores or eggs. Now it must be observed concerning this method of inquiry that it could never be final; it is incompetent by deficiency. Its results could never be exhaustive until the life-histories of the organisms involved were known. And further, although it is a legitimate method of research for partial results, and was of necessity employed, yet it requires precise and accurate manipulation. A thousand possible errors surround it. It can only yield satisfactory results in the hands of a master in physical experiment. And we find that when it has secured the requisite skill, as in the hands of Prof. Tyndall for example, the result has been the irresistible deduction that living things have never been seen to originate in not-living matter. Then the ground is clearer for the strictly biological inquiry, How do they originate?

To answer that question we must study the life-histories of the minutest forms with the same scrutiny and thoroughness with which we study the development of a crayfish or butterfly. The difficulty in the way of this is the extreme minuteness of the organisms. We require powerful and perfect lenses for the work. Happily during the last fifteen years the improvement in the construction of the most powerful lenses has been great indeed. Prior to this time there were English lenses that amplified enormously. But an enlargement of the image

of an object avails nothing if there be no concurrent disclosure of detail. Little is gained by expanding the image of an object from the ten-thousandth of an inch to an inch, if there be not an equivalent revelation of hidden details. It is in this revealing quality, which I shall call magnification as distinct from amplification, that our recent lenses so brilliantly excel. It is not easy to convey to those unfamiliar with objects of extreme minuteness a correct idea of what this power is. But at the risk of extreme simplicity, and to make the higher reaches of my subject intelligible to all, I would fain make this plain." Dr. Dallinger then went on to give a series of greatly magnified illustrations, beginning with the sting of the bee, and going on through a long series of interesting specimens of the lowest forms of life. He described and illustrated with great minuteness experiments in the generation of these forms of life, from all of which he maintained it to be clearly proved that dead matter cannot be developed into living.

"We conclude," he said, "with a definite issue—viz. by experiment it is established that living forms do not now arise in dead matter. And by study of the forms themselves it is proved that, like all the more complex forms above them, they arise in parental products. The law is as ever, only the living can give rise to the living."

INTERCELLULAR SPACES BETWEEN THE EPIDERMAL CELLS OF PETALS.—While the cells of the epidermis of leaves fit close to one another, without any intervening spaces except the stomata, the case appears different, according to G. H. Hiller, with the epidermis of petals, where there are very often spaces between the cells, especially in Dicotyledons. The size and form of these spaces vary with the species. They are situated either between the walls of the cells themselves, and then usually at the point of contact of several cells, or in rib-like foldings of the cell-walls. On the inner side of the leaf they are usually open, where not accidentally covered by a parenchyma-cell, while on the outer side they are always covered by the cuticle. Very rarely they occur in epidermis with straight-walled cells, and then always from their effort to round themselves off. They are then always found at the point of contact of several cells.

Reviews.

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THE CENTURY CO., New York, N. Y.

A FINAL REPORT ON THE CRUSTACEA OF MINNESOTA. By C. L. Herrick, Minneapolis, Minn., 1884. pp. 200. 25 plates.

THE ORIGIN OF SPECIES. By Charles Darwin. Complete in two parts, 30 cents each. p. 260.

THE CHILDHOOD OF THE WORLD, a simple account of man in early times. By Edward Clodd.

ILLUSIONS, a psychological study. By Jas. Scully.

The three works mentioned are from the house of J. Fitzgerald, No. 20, Lafayette Place, New York. They are for sale by Willis Boughton, Ann Arbor, Mich.

DRUGS AND MEDICINES OF NORTH AMERICA. J. U. and C. G. Lloyd, Cincinnati, Ohio.

The October number of this quarterly contains some beautiful illustrations and is well filled with reading matter. It is receiving a handsome reception from botanists and pharmacists.

TO MOUNT BONE.—Unsoftened sections of bone may be successfully mounted in Canada balsam or damar solution, and exhibit their canaliculi very clearly if they are coated with a thin film of strong, clean gum previous to being placed in those reagents. A film of collodion may also be used in place of the gum.—*Cole's Studies.*

THE DIOSCOPE.—The dioscope does for the eye what the telephone does for the ear. An objective lens is fitted in some hall of entertainment, and by an electric wire communication is established with a small white glass plate in a room, at any distance. Excluding the light from this room, a complete reflection is obtained of what is passing in the hall.—*Ex.*

THE PINEAL GLAND.—The pineal gland of vertebrates has been a stumbling-block in the way of morphologists, and in a recent paper Ahlborn supports the view, recently advanced, that it is the rudiment of a primitive median eye, adducing in evidence the fact that it is connected with the optic thalami; its method of formation, and its position in the lower vertebrates and in the amphibians. The author thinks it permissible to compare it with the single median eye of tunicates and Amphioxus.

Items.

Mr. R. N. Reynolds, of Detroit, has published some "Notes on Microscopic Work," consisting of sixteen pages, with the suggestive title, "A Rat followed from the Corn-crib to the Microscopist's Cabinet."

CELLULOSE ACCOMPANYING THE FORMATION OF CRYSTALS.—A. Poli has noted in the pith of a number of plants belonging to the order *Mælvaceæ*, clusters of crystals attached to the cell-wall by strings of cellulose. He has examined the structure of these strings, and finds them to be hollow tubes. They generally exhibit swellings here and there, and bright refringent spots, which are probably the points of origin of new crystals. Their composition is the same as that of the cell-wall, and they not unfrequently become liquified in the same way. They appear to occur in all the arborescent species of the order, most beautifully in *Malvaviscus mollis.*

THE TUBERCLE BACILLI.—So far as Koch's work upon tuberculosis is concerned, it remains a complete monument of scientific accuracy, and has suffered nothing in the time since it was erected. The strength of his arguments has not been in the least weakened, the accuracy of his experiments stands unassailed, and the justness of his conclusions is thus far incontrovertible. As matters stand to-day, we are bound to consider that the cause of tuberculosis is found, and that that cause is, or is contained in, the bacillus of Koch, to whom all honor is due for the beauty and completeness of his investigations upon this important subject.

APPARATUS IN LEAVES FOR REFLECTING LIGHT.—O. Penzig has examined the structure of the clusters of crystals found in the leaves of the *Aurantiaceæ*, clothed with cellulose, and attached to the wall of the mother-cells, the idioblasts of Pfitzer; and believes they are connected with the dispersion of the rays of light in the dense palisade-tissue. They always have their principal axis vertical to the surface of the leaf, and are fixed in this position by a peculiar band of cellulose. The rays of

light fall, therefore, parallel to the principal axis of the crystals, and are dispersed on all sides from their reflecting surfaces, while those which pass through the crystals are refracted obliquely. It is possible that the subepidermal cystoliths in the leaves of *Ficus* have a similar property.

EXCHANGES.

(Exchanges are inserted on this page without charge. Subscribers having microscopic apparatus for sale or exchange can announce the same without charge).

HISTOLOGICAL and Pathological slides to exchange for other good slides. F. F. COLWELL, Urbana, Ohio.

FRESH-WATER ALGÆ, nearly all genera, and many beautiful varieties; also euglena, astasia, etc., for good pathological or other interesting slides. Lists exchanged. J. M. ADAMS, Watertown, N. Y.

WOULD like to exchange a $\frac{1}{6}$ Bausch & Lomb patent adjustment (glycerine front) objective, almost new, for a $\frac{1}{4}$ of moderate angle, C. B. HIGBY, Mokelumne Hill, Cal. Co., California.

I HAVE a first-class black glass rotating stage, with sliding object carrier kept down by ivory pointed screw. Will exchange for a low power objective, works on microscopy, or first-class mounted objects, HAROLD PLOWE, 136 High St., Peoria, Ill,

WANTED.—Diatoms on Algæ, from the Sandwich Islands, Californian coast, and other tropical sea coasts. Will give in exchange either very good mounted micro-slides or cash for good material. J. C. PRINNBOCH, 14 Simmering, Wien, Austria.

FOR SALE.—A copy of Prof. Leidy's great work on the Rhizopods has been left at this office for sale. Price $7.50. C. H. STOWELL.

I WILL exchange good, histological for other first-class mounts. S. G. SHANKS, M. D., 547 Clinton Avenue, Albany, N. Y.

HISTOLOGICAL mounts to exchange for other good slides. T. B. STOWELL, Ph. D., Cortland, N. Y.

HISTOLOGICAL SLIDES, very thin and evenly cut, well mounted and well ringed, will be exchanged for Pathological or Histological slides only. H. L. WHITNEY, M. D., German Hospital, Phila., Pa.

WALMSLEY'S Photo-Micrographic Camera and Plate-Holder, together with the Chemical and Printing outfits, and a Darlot's Focusing Glass, for sale. Also, Sidle's Iris Diaphragm, with society screw for substage; Beck's 1 in. and $\frac{1}{2}$ in. Objectives (National); Bausch & Lomb's 2 in. Objective. F. J. SCHAUFELBERGER, M. D., Fostoria, Ohio.

GUNDLACH'S adjustable 1-5 objective, 135° aperture, for sale. Dr. A. C. Stokes, Trenton, N. J.

DIATOMS ON ALGA. Achnanthes bevipes, etc., Polycistana, Fossi Diatoms, etc., Sertularia Pluma, Sertularia Crustata, etc. Spore case of Fern too numerous to mention, to exchange for well mounted objects WM. FARNELL, Macon, Ga.

PLEASE ANNOUNCE that I will supply labels, cards, and other first-class printing in exchange for good slides. EUGENE PINCKNEY, Dixon, Ill.

EXCHANGE.—Untreated diatoms and miscellaneous material in large variety to exchange for good prepared material for mounting of any kind. M. A. BOOTH, Longmeadow, Mass.

EXCHANGE—I have about one hundred lantern slides to exchange for Microscopical apparatus (object-glasses), etc W. S. WHITE, 128 and 130 W. Main street, Kalamazoo, Mich.

EXCHANGE.—A Tolles' Binocular Eye-piece, (cost $80.00), for a first-class, wide angle Objective. J. T. MAIN, Jackson, Mich.

ACARI INSECTS, Pathological and other well mounted slides in exchange for Pleurosigma, Trichina, Diatoms, Stained Bacteria, etc. J. O. STILLSON, Indianapolis, Indiana.

FOR SALE,—Slides, double stained, of Bacillus Tuberculosis, 50c. each. DR. W. R. CHITTICK, 83 Lafayette Avenue, Detroit, Mich.

WANTED.—Books treating on microscopical and histological subjects not already in my possession. Will pay cash or give slides in exchange. State name of the work, date of issue, and price. C. H. STOWELL, Ann Arbor, Mich.

AMPHIPLEURA PELLUCIDA or any other test diatom mounted in the new medium having refractive index of 2.4 can be procured from H. H. CHASE, M. D., Geneva, N. Y.

SECTIONS of bone of cat, and purcupine quill, seed of Papara somniferum and Lychnis githago, eye spots and pieces of wings of Attiacus cebropia and prometheus, etc., for other good slides. HOWARD N. LYON, 80 South St., Auburn, N. Y.

I WILL send a quantity of good diatomaceous material containing Bacillaria Paradoxa—all living—in exchange for well mounted slides. JAS. C. LATHROP, Bridgeport, Conn.

LIVING or mounted red *astasia* hæmatoides (Euglena viridis) also *Valvox* and other choice Algæ in exchange for Algae, fungi or infusoria. J. M. ADAMS, Watertown, N. Y.

WILL Exchange mounted slides of various crystals, diatoms, in situ, stellate hairs of plants and micio fungi, for other good slides or material. JAMES E. WHITNEY, Rochester, N. Y.

PATHOLOGICAL, Histological and other well mounted slides will be exchanged for mounted specimens of interest. Lists furnished on application. D. E. HAAG, M. D., Liberty Center, Henry County, Ohio.

WOULD like to exchange a 1-6 objective, 160°, adjustable, for a lower power. A. Y. MOORE, 89 Prospect street, Cleveland, Ohio.

THE MONTHLY MICROSCOPE ILLUSTRATED.

VOL. IV. ANN ARBOR, DECEMBER, 1884. No. 12.
WHOLE NO. 29.

Original Communications.

STUDIES IN HISTOLOGY.

C. H. STOWELL.

LESSON VI.

THE AMŒBA AND THE CELL.

LOW down in the scale of animal life are found minute organisms of variable size inhabiting stagnant water, mud, and water in which animal matter has been infused and exposed to the direct rays of the sun. They have the appearance of a particle of the white of egg, clear and transparent, perhaps slightly granular, quite fluid in the centre and of firmer consistence towards the periphery.

They are especially remarkable for their incessant and rapid changes of form, causing them to move about, but not in any particular direction. Their movements are affected by a flow of their protoplasm, causing them to thrust out prolongations, known as *pseudopodia*. The dense exterior is known as the *ectosarc*, the more granular fluid interior, the *entosarc*. In some amœba there appears a clear spot which dilates to a certain extent, then contracts rapidly and disappears only to reappear

again with tolerable regularity; this is the *contractile vesicle.* It seems to serve two purposes first, as a pump to force water into and out of the body, and second, as a means of procuring food, for when dilated to its full extent it will sometimes contract with such vigor as to break through the ectosarc and cause its contents to rush out into the liquid in which it lies. It then dilates, causing a strong suction force which draws in a certain amount of water and with the water, infusoria, entozoa, and vegetal forms, the food of the amœba.

A nucleus and nucleolus are occasionally seen.

The first thing noticed in examining one of these little animals is, *it is contractile.* Its peculiar amœboid movements and its flow of protoplasm are identical in their fundamental nature with the movements occurring in a muscle during its contraction. Another thing noticed is, *it is irritable and automatic.* If a foreign body be brought in contact with an amœba when it is at rest, movements result. These movements are not passive in their nature, proportionate to the force employed, but are the result of an explosion of the energy of its living matter. Rarely does one see the amœba at rest. It is almost constantly changing its form, not from external stimuli, but from changes of its substance, the cause of which lies within the body itself. The marked features of nervous tissue are its irritability and automatism.

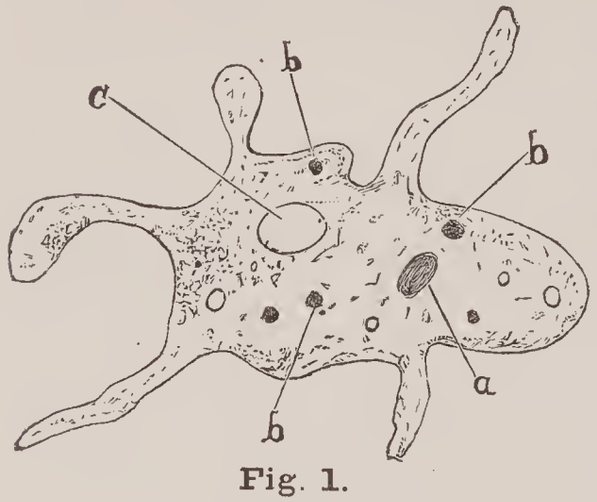

Fig. 1.

Amœba. a, nucleus; b, foreign bodies; c, vacuole.

Again, it is noticed that *it is secretory and excretory.* Besides the method described above, the amœba has another way of procuring food—by extending around the object its pseudopodia until the particle is completely surrounded by the living matter. Here the foreign body remains for a time. If it be suitable for food it soon becomes changed into material like the mass surrounding it,—into "amœba stuff." Part of it may be changed and the remainder thrown off as excrementitious matter or the whole may be served in a similar manner. If all the particle be not assimilated then the amœba simply moves away by

its flow of protoplasm and leaves it behind. There must be chemical products present for the purpose of dissolving and effecting changes in this raw material taken as food. These must be regarded as *secretions*. The amœba is certainly *excretory*. In man, the digestive, urinary, and pulmonary tracts, and the epithelia represent this physiological property of the amœba.

It is further noticed that the amœba is *metabolic*, constantly undergoing chemical change. Certain cells in the human body are specially reserved for carrying on chemical changes. Their material is derived from the blood and their products are finally returned to it. Such cells are the fat cells, liver cells, also the lymphatic and ductless glands and in one sense, the blood.

The amœba is also *reproductive*. After attaining a certain size or living a longer or shorter life, it may by division resolve itself into two parts, each of which is capable of living as a complete unit. The amœba divides by becoming constricted in its centre, by its protoplasm flowing in opposite directions, or by a pseudopodium detaching itself from the body of the cell. Certain cells are set apart in the human body for the accomplishment of this purpose. Such collections of cells are the ovary and the testis. The amœba, therefore, has the following properties:

It is contractile.
It is irritable and automatic.
It is secretory and excretory.
It is metabolic.
It is reproductive.

Man, then, is but a federation of amœbiform units. Certain of these units have been exclusively set apart for the manifestation of certain of the properties of protoplasmic matter. These groups have received the name of *tissues*. With this grouping there has come a change in structure in order that the part might better perform its function. At one period in the history of these cells they were as simple as our amœboid unit; in fact, for that matter, at an early period in the history of every life the whole being, the embryo, was but a mass of units as simple in their structure as the amœba. Such cells remain in this amœboid condition in the body for a considerable time; such cells

are the mucous and pus corpuscles, and the white corpuscles of the blood.

At a bound, then, one passes from this low creature to the highest, to find that the tissues of the latter are but collections of the former. So a tissue is chosen and with the aid of the knife and needles its parts are for a time successfully separated.

But at last a period arrives when even this will not answer, and we turn to the microscope to find the tissue compounded of thousands of the smallest elements. To discover and to examine these constitute *the science of tissues, or histology.*

While the cell existed as an amœba it acted in an independent manner, but now that it is in the service of a unity of cells it is a subordinate and must conform itself to its surroundings.

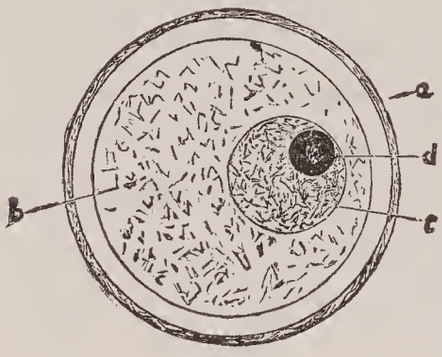

Fig. 2.

Human ovum. a, vitelline membrane; b, vitellus; c, germinal vesicle; d, germinal spots.

Each cell in the body then is a living individual with an individual function. Some of these cells are very small, for it will soon be stated that five millions of them can be contained in a particle of the substance of the body no larger than a cubic millimetre. Some are so large that they are nearly, if not quite, visible to the unaided eye. In shape, also, there is the greatest variation. First, there is the spheroidal cell, from which the bodies of all the higher animal have proceeded, the ovum. As a result of compression and adaptation come other forms, from the slender cylindrical cell to the flat and scaly one. Still other cells appear with branched processes growing from their bodies in various directions. There exists, then, every variety of shape and form in the fully developed cells, although it will be stated, farther on that early in their history they were all alike, simple, undifferentiated bioplasm.

In a well-developed epithelial cell from the surface of the tongue two parts are readily recognized. First, the nucleus, a round or oval body, occupying a small part of the cell near or in its centre, and second, the part of the cell surrounding this nucleus.

The alkaline solution of carmine is capable of coloring the different parts of a tissue or cell to different degrees. In a cell it is noticed that the innermost part is invariably colored the most intensely. In the case of the epithelial cell the nucleus will be stained a deep red by the carmine, while the outer part will remain unaffected. Now if any young or rapidly growing epithelial surface be examined, as the layer of epithelium over a papilla of the tongue, those cells nearest the blood vessels will be seen to take the carmine staining completely. They are composed of nucleus matter alone; from this matter must come all the future parts of the cell. No matter how high or complex the tissue, it must proceed from this first living germinal matter, the *bioplasm* of Beale. If the cells be examined a little farther from the nutrient vessel a material will be seen surrounding the nucleus which does not take carmine staining. This was once living nucleus matter but now from coming in contact with air or fluids, or for other reasons, death occurs upon its surface and the nucleus or germinal matter becomes changed to lifeless formed material. Still farther away on the surface of the papillæ the nucleus of the cells has nearly disappeared. At this point the cell is so far removed from its supply of pabulum that it has become gradually changed. Nutritious material then is deposited from the blood, first, in the centre of the living part of each cell, the nucleus, is being constantly replenished, its outer part is as constantly passing into lifeless formed material. All matter must be *nucleus matter* before it can become *formed material.* Only nucleus matter can be said to live, *because it is capable of converting material unlike itself into material like itself.* The nuclei of muscle convert common pabulum into muscle nuclei which is thence converted into muscle formed material. The nuclei of nerve

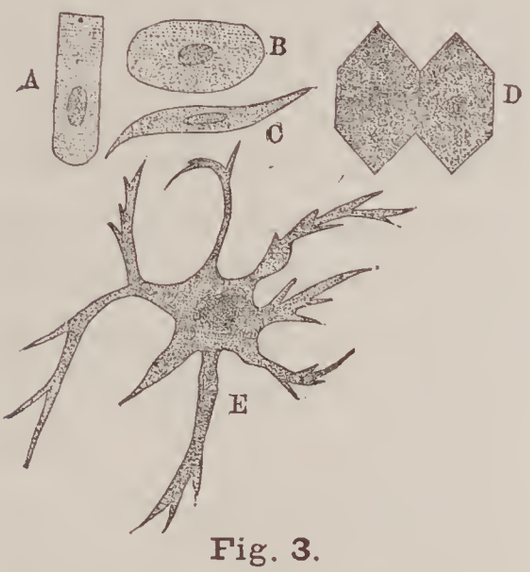

Fig. 3.

A, cylindrical cell; B, flattened cell; C, spindle-shaped cell; D, pigment cells; E, branched cell. x 400.

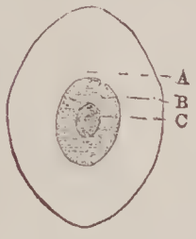

Fig. 4.

Fully developed cell. a, formed material; b, nucleus; c, nucleolus.

cells are capable of taking some of the same pabulum and converting it it into nerve nuclei and thence into nerve formed material. Thus, man, a federation of these cells, is capable of converting his food into materials like his own body, hair, nails, skin, etc., while the dog by eating of the same food will convert it into its own peculiar tissues. The youngest, most recently deposited matter of a tissue is found in its nuclei, the oldest in its formed material. There is a law in the body by which the amount of pabulum supplied to the nuclei by the blood, just equals the wear and waste of the cells. But if from any cause the part be irritated, be spurred to increased action, then an extra amount of blood flows to the part, an extra amount of pabulum is furnished to the germinal matter, causing it to increase rapidly. Now from two to five nuclei are seen in one cell. If the process goes on the changes become so rapid that the germinal matter does not change into formed material, and there now appear a multitude of round, globular bodies, in cells, and on the surface of cells, familiarly known as *pus*. Doubtless some of these pus cells are the migrated white corpuscles of the blood, but the mass of them represent *living germinal matter undergoing rapid changes and possessed of a low vitality*. This germinal matter may come from an irritated cell. It must be borne in mind that the supply and change of pabulum to the germinal matter, and from it to the formed material of the body are constant and uninterrupted. From what has been said it must be evident that compared to human life, the life of any one cell is extremely short.

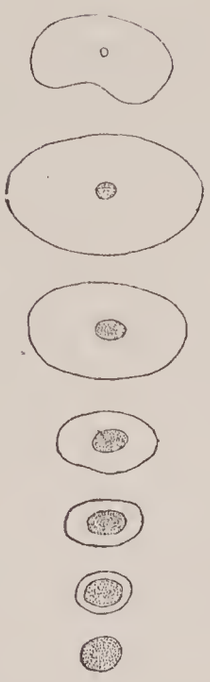

Fig. 5.
Illustrating diminishing nuclei in cells as they approach the surface.

Fig. 6.
Pus in epithelial cells found in urine. x 250.

When we consider the immense numbers of cells removed daily from the surface of the body by the friction of clothing—laying aside the work of the sponge and towel—some idea can be gained how active must be the changes going on just beneath the surface. Add to this the number rubbed off by every act of moving the tongue, in speaking, drinking, and eating, and we

commence to understand how most of the cells are destined to an early death. This great loss is replaced by the formation of new cells and by the division of those already formed,—the nucleus dividing first, then the whole cell becoming separated into two by constriction.

In order to understand the most complex we study the most simple. That we may the better understand the highest, we watch the lowest, for they all receive new material and transform it into the constituents of their own bodies. They live, they grow, they reproduce their kind, they die.

THE PARASITE IN "CHICKEN GAPES."

At a late meeting of the Buffalo Microscopical Society, Dr. Walker, of Franklinville, detailed the results of some experiments upon "the gape worm of fowls."

"The disease among poultry called the gapes was first described by Dr. Wiesenthall of Baltimore in 1797, subsequently by the English naturalist, George Montagu, in 1808. Both recognized a small worm in the trechea as the cause of the disease. In 1879 Lord Walsingham of England offered a prize of $500 for the most complete life history of the parasite causing the gapes. Dr. Pierre Megnin, a noted French naturalist, received the award. He supposed no intermediate host was required, but the parasite was developed in the fowl from picking up the eggs scattered upon the ground or the embryos after they were hatched in water. Before the present investigation was begun, a little more than one year ago, it was generally supposed some intermediate host was required, but what that was no one had any definite idea. That the earthworm is the original host is proved by eight separate experiments with as many different chicks, by feeding them earthworms from a locality where chickens had the gapes. In every instance the gapes was produced in a little less than seven days. The earthworms were examined and the parasite found coiled up in the structure of the worm in the same manner as trichinæ are coiled up in their cysts. That all earthworms do not contain the parasite was proved by feeding chickens earthworms from a locality where they did not have the gapes. The disease was

not produced. On examining the worms with the microscope this parasite was not found. The life history of *Syngamus trachealis* is as follows: Earthworms containing the embryos are eaten by the fowl. The embryos are liberated from the earthworm and free their way through into the air sacs, thence work their way to the lungs where they pass through the nymph stage and acquire sexual maturity. The male and female then unite and attach themselves by their sucker-like mouths to the mucous membrane of the trachea. Between six and seven days are required from its entrance into the fowl until its attachment to the trachea. In seven days more the eggs within the body of the worm become mature; they are coughed up, swallowed by the fowl and pass through it into the soil. In three weeks these eggs, exposed to the moisture and sun, hatch the embryos, find their way into the earthworm, where they remain until picked up by some bird, when the above process is repeated. Some years one-half or two-thirds the young fowls in some localities are destroyed by the gapes. This investigation proves that if young fowls are kept from eating earthworms that terrible scourage of poultry, the gapes will be prevented.

THE PHENOMENON OF MULTIPLE IMAGE.

I HAVE recently observed that the phenomenon of multiple image may be produced in certain diatoms, notably in Troceratium Favus. Dilligent search in such books as are accessible fail to give me any information on the subject, or in fact men tion it at all. I therefore presume that it is not generally known. I suggest that a careful study of the beetles eye and the question of optics involved will prove a step towards solving the problem of the markings on the diatom valve. If you think the subject of sufficent interest to your readers to publish this I shall be glad to hear through the same channel the result of their inquiry.

K.

Brooklyn, Nov. 12, 1884.

A large number of our subscribers have already renewed. Will about fifteen hundred more send us their dollars before our next issue ?

THE ORIGIN OF RENAL CALCULI.

I NOTICED the following peculiarity in a case recently under my care. In examining a drop of the urine there were to be seen in many parts of the field small collections, from three to seven, of red blood corpuscles seemingly surrounded by a fibrinous mass. On these masses were deposited a myriad of minute acicular crystals. Changing the ocular for a number six, and using the very outside of the angle, 160° +, I was able to find individual red blood corpuscles, on whose surface crystals of uric acid were being rapidly deposited. The bearing of this on Ultzman's theory of the origin of renal calculi is plain.

B.

THE September numbers of the *Journal of Microscopy* and *The Microscope* are at hand. The former alludes editorially to the Rochester meeting of the American Society, and says it is to be hoped that the general run of papers read and proceedings had on that occasion will not be taken as representative of American microscopical science. The journal gets its report of what was done from the garbled extracts of a daily paper—showing how much interest Professor Hitchcock really takes in the American society. He is good enough, however, to remark that the society has his best wishes—*for which the society no doubt feels deeply grateful.* Professor Stowell's journal, *The Microscope*, on the contrary, contains little else than extracts from the proceedings of the society, the reason therefor being one in which all who have the pleasure of knowing the professor and his talented wife will deeply sympathize—viz., the severe illness of the latter at Philadelphia. Mrs. Stowell, besides being a most accomplished manipulator of the microscope, drawing with facility with pen and pencil, is a lady of rare social endowments, and it is to be hoped that her illness will not be followed by any permanent evil effects.—*National Druggist.*

☞ PLEASE RENEW YOUR SUBSCRIPTION FOR 1885.

Results of Microscopical Research.

IN this department of THE MICROSCOPE it is our intention to give each month, a series of abstracts of the more important papers which are appearing in all parts of the world, and which are largely or wholly the results of investigations with that extremely useful instrument which gave its name to this journal. In preparing these abstracts we have taken as our model those found in the valuable Journal of the Royal Microscopical Society, only endeavoring to express the ideas in plain language, and in some cases prefacing the abstract with a review of what was known before upon the subject, so that the bearing of the new results may be apparent at a glance. The subjects embraced will be chiefly confined to investigations on the minute structure and the development of animals and plants, thus rendering our Magazine a necessity for all teachers and students who wish to keep posted on the most recent morphological researches and who, by locality, are debarred from the use of the larger libraries.

With each article we shall give a reference to the original paper so that those who may wish to read it at length can readily find it. As our space is limited we have adopted a system of abbreviations for the Journals from which we shall most frequently quote, a list of which is here given. Other abbreviations may be occasionally used but in most cases they will be self explanatory.

ABBREVIATIONS:

A. f. m. A.	—Archiv für mikroskopische Anatomie (Max Schultzes Archiv).
A. f. N.	—Archiv für Naturgeschichte (Wiegmann's Archiv).
Am. Jour.	—American Journal of Science and Art ("Silliman's Journal").
Am. Nat.	—American Naturalist.
Ann. and Mag.	—Annals and Magazine of Natural History.
Ann. Sci. Nat.	—Annales des Sciences Naturelles.
Arb. Wien.	—Arbeiten a. d. zoologische Institut der Universität Wien (Claus's Arbeiten).
Arb. Würz.	—Arbeiten aus dem zoologesche, zootomisches Institut zu Würzburg. (Semper's Arbeiten).

Arch. Biol. —Archive de Biologie.
Biol. Cent. —Biologische Centralblatt.
Bot. Cent. —Botanische Centralblatt.
Bot. Gaz. —Botanical Gazette.
Bot. Zeit. —Botanisches Zeitung.
B. M. C. Z. —Bulletin of the Museum of Comparative Zoology.
C. R. —Comptes Rendus of the French Academy.
Jour. Linn. Bot.—Journal of the Linnean Society, Botany.
Jour. Linn. Zool.—Journal of the Linnean Society—Zoology.
J. R. M. S. —Journal of the Royal Microscopical Society.
M. M. C. Z. —Memoirs of the Museum of Comparative Zoology.
Mem. Bost. —Memoirs of the Boston Society of Natural History.
Morph. J. B. —Morphologesche Jahrbuch.
Neap. Mitth. —Mittheilungen a. d. zool. Stat. zu Neapel.
Nature. —
Proc. Am. Acad.—Proceedings of the American Academy of Arts and Sciences.
Proc. Bost. —Proceedings of the Boston Society of Natural History.
Proc. Can. —Proceedings of the Canadian Institute.
Proc. Conn. —Proceedings of the Connecticut Academy of Arts and Sciences.
Proc. Phila. —Proceedings of the Academy of Natural Sciences of Philadelphia.
Proc. R. S. —Proceedings of the Royal Society.
Phil. Trans. —Philosophical Transactions of the Royal Society.
Proc. Z. S. —Proceedings of the Zoological Society of London.
Q. J. M. S. —Quarterly Journal of Microscopical Science.
R. Z. S. —Recueil Zoologique Suisse.
Science. —
Torrey Bull. —Bulletin of the Torrey Botanical Club.
Z. w. Z. —Zeitschrift für wissenschaftliche Zoologie (Siebold and Kölliker's Zeitschrift).
Z. A. —Zoologische Anzeiger.

EMBRYOLOGY OF SPONGES.—Professor W. J. Sollas describes (Q. J. M. S., xxiv, p. 603, 1884) some of the early stages of the development of *Halisarca lobularis*. The segmentation is irregular and a blastula is formed by the migration of the cells to the exterior, a segmentation cavity not normally being formed. The gastrulation takes place in a normal manner, but it is accompanied by numerous other infoldings of the surface so that it is not always easy to decide which is the true invagination. These other folds eventually produce the water-canal

system. Prof. Sollas obtained his material at Roscoff on the English channel, and it is noticeable that the embryos are retained in the tissues of the parent for a longer time than in the case of the same species in the Mediterranean. This is accounted for on the basis of natural selection. In the channel the tides and currents are very strong and were the young set free at an early age they would run a good chance of being swept away from favorable localities; in the Mediterranean no such dangers exist and it is obviously for the benefit of the parent to set its progeny free at the earliest moment and thus save the drain on the parent. Prof. Sollas indulges in some speculations as to the relationship of the sponges, and agrees with all other morphologists that the protozoan nature advocated by Clark and Saville-Kent is not warranted by the facts. He is inclined to make a third division of the animal kingdom (besides the Protozoa and Metazoa) for the reception of the sponges for which he coins the name Porozoa. We have great doubts as to the validity of this course; at all events the arguments advanced are far from conclusive.

SYMBIOSIS.—Dr. Keller in the course of an interesting paper on *Cotylorhiza* (Rec. Z. S., 1 p. 403,) touches upon the question of symbiosis. For some time past there has been a dispute whether certain cells in the tissues of some of the lower marine animals were really component parts of the organism or whether they were of the nature of algæ, living a sort of parasitic life, which proved of benefit to both. Dr. Keller inclines to the latter view, at least in regard to the yellow cells found in *Cotylorhiza*. The subject is an extremely interesting one and we may recur to it again.

ANATOMY OF INSECTS.—We would call the attention of the readers of THE MICROSCOPE to the valuable series of articles now being published in Hardwicke's *Science Gossip* on the anatomy of the cockroach, by Prof. L. C. Miall and Alfred Demsey. The first article was published in March, and gives an account of the external appearance, the habits, etc. In May the external skeleton, mouthparts and other appendages were described. The alimentary canal was taken up in July, and the respiratory and circulatory organs in September. In the November number the nervous system and the eyes are described. Any one

wishing to take up the study of insects will find it of great advantage to purchase this volume of *Science Gossip*, and then cockroach in hand, go through the points mentioned. Even better would it be to take a grasshopper rather than a cockroach. The two belong to the same order, the Orthoptera, so that the same general account would in its broader features be applicable to both, while the points of difference would be such as to lead the student to rely on himself.

Dissecting insects is not such a difficult task as many seem to suppose. The only instruments absolutely needed are a pair of fine scissors, a pair of fine pointed forceps, and a couple of sharp needles mounted in penholders. The dissection should be carried on under water. The plan for holding the object, which has been adopted by the writer, is very simple and very convenient. An empty blacking box is filled to a depth of about an eighth of an inch with melted beeswax, and, while this is still in a liquid condition a grasshopper is placed in it in the desired condition and the whole left to cool, when hard, water is poured in and the dissection begun. The integument is removed from the portion of the insect above the wax by means of the scissors, great care being exercised not to injure the underlying tissues. Almost all subsequent operations can be carried on with the needles. When one specimen is used up the wax is again melted and another insect inserted.

In working out the details a magnifying glass carried on a suitable support will be necessay. Ordinary ingenuity will contrive a device which will prove as satisfactory as any of the more expensive so called dissecting microscopes. For the minute structure, the section knife, and the compound microscope will be required. The general technique necessary for this histological investigation will soon be described in the pages of this journal.

BACTERIA ON COINS.—Of all the nonsense which has enlivened the science of recent years there is none which excells the recent lucubrations of Dr. Paulus F. Reinsch, on the presence of Bacteria on coins. His article has been quoted and reprinted in numberless journals whose editors ought to have known better. Bacteria on coins? Of course there are. Bacteria are everywhere. Scrape your tongue and you will find more specimens than would accumulate on a considerable pile of dollars.

Editorial Department.

OUR JOURNAL FOR 1885.

We have no particular promises to make for the coming year. We are very glad not to be forced into the mortifying confession that some articles promised for this year have not yet been published. We have only to say that as we have more than fulfilled our promises in the past, so in the future we propose to maintain this reputation by keeping our pages full of such interesting matter as will enable our Journal to maintain its position as the leading microscopical journal in the country, and, we may repeat, the only one devoted solely to the encouragement and advancement of scientific study with the microscope, and published independently of any considerations of personal gain or business interest.

We have written the above editorial with some outside help. It is true, only "we are obliged to admit" that we *do* work for personal gain and business interest. We would not publish our journal a month unless it brought us a net income. Our journal is founded on a strict business basis. Our printers can certify that our bills are settled monthly. We believe that only in this way can our readers be assured they are subscribing for a journal that "has come to stay."

How many men are there in this active country who *love* microscopy enough to *deliberately* engage in publishing such a bright journal as was *The Lens*, only to find themselves about three thousand dollars out of pocket at the end of two years service? How many stand ready to resurrect three or four other microscopical journals that might be mentioned, with the distinct understanding that there shall be no personal gain or business? Charity is one thing. Business is another. But microscopy is not charity. While many criticisms may be made about this journal and while many emergencies may arise to cause its suspension, yet one thing goes on record as an indisputable fact: *It is a journal that pays all of its bills and leaves a handsome surplus in the treasury at the end of the year.*

VALUABLE ARTICLES FOR NEXT YEAR.

In our January number we begin the publication of a series of articles, the object of which will be to encourage students and microscopists to study EMBRYOLOGY. To adapt it to inland students, only terrestrial and fresh-water forms will be included. The series will begin with a plain and concise account of the broad features of general embryology; then will follow an account of the development of special groups; and last, but not least, the articles will tell the student just how to conduct investigations of the same character, including all the technique of hardening, staining, section cutting, and mounting. The first article for the January number is already in type. It is fully illustrated, and is entitled "The Embryology of Insects." The author still insists upon our withholding his name for the present. He is the author of "Hints on Technique" in our November number; of "Results of Microscopical Research," in the present number; and is author also of some of our most valuable text-books and original contributions to science. The latter alone cover over 500 octavo pages. Anticipating a large demand for these continued articles, from teachers and students, we shall issue an extra large edition next month. Parties wishing extra copies in lots of twenty or more, for class work, will be supplied free, by giving us timely notice.

THE MICROSCOPE IS ALWAYS READY.—A consideration that greatly recommends the use of the microscope is the fact that it is never too cold or hot, too dry or wet, too cloudy or bright for work. It works well by daylight or lamp-light. There is always something for examination and study. By its use a world of life and beauty, otherwise utterly unknowable, is made known. Our ideas and notions of things are greatly changed and enlarged. Plants become living things, many of them marvelous motions and powers. We find them performing most exquisite and graceful maneuvers, moving in all directions, and traveling from place to place. We find other plants living in wonderfully beautiful glass houses, chased with lines and sculptured as no human hand can sculpture. We see through and through plants and animals, and observe all their varied internal structures and motions.—*Ex.*

Selections.

MOUNTING.

MOUNTING THE DIATOMACÆ.

For a considerable time experiments have been in progress in the hope of discovering a medium, in which to mount Diatoms, which should be more satisfactory, in respect of its refractive index, than Canada Balsam, and equally reliable and permanent; many such media have been tried—phosphorus, monobromide of naphthaline, and others; but it is unnecessary to enter into details concerning them, since the desired effects have recently been obtained by Dr. Van Heurck, who has succeeded in providing an admirable substitute for Balsam in gum-styrax, which yields the best possible results. It will probably be found that Diatoms mounted in gum-styrax are less liable to accidents than Balsam "mounts," as the latter becomes resinous in time, and the covers are liable to "spring;" the result of which is the appearance of prismatic colours in the Balsam, which are not only a great eyesore, but sadly deteriorate the slide. Gum-styrax may be considered absolutely permanent and unalterable. Purified styrax contains a granular substance, which must be removed by dissolving it in chloroform and filtering the solution. The solution thus obtained is used in the same manner as Canada Balsam. Styrax solution is even easier to work with than Balsam, and air-bubbles are not produced in it by the application of heat. The crude styrax, as purchased, should be exposed in a thin layer to the sun for several weeks. In this way much of its yellow color is discharged, the water it contains evaporates, and it becomes hard. It may then be dissolved in chloroform, as already described. Instead of chloroform, benzine, or a mixture of benzine and absolute alcohol may be employed in making the solution, while a solution in ether will prove valuable when rapid "setting" of the medium is desired.

CLEANING AND MOUNTING POLYCYSTINA.

The siliceous shells of these lovely organisms, the beauty of which is only equalled by their variety, are found in profusion,

and intermixed with Diatomaceous valves, often of extreme beauty and rarity, in the deposits (or so called "earths") of Barbados, the Bermudas and the Nicobar Islands, while an entirely new and magnificent deposit was discovered by the late Captain Perry, of Liverpool, at Jeremie, Haiti, which contains not only a large number of novel species of Polycystina, but many entirely new varieties of Diatoms.

The Polycystinous "earth" should be broken into small pieces, about the size of a nut, and boiled for half-an-hour to an hour, in a strong solution of common "washing soda;" the disintegrated portions being poured off into a large vessel containing clean water, from time to time, and the boiling in soda repeated, as also the pouring off, until the whole mass is perfectly broken up. When the disintegrated matter in the large vessel shall have thoroughly settled down it should be subjected to several washings, in order to remove the soda, the material being allowed to settle thoroughly after each washing. It should then be removed to a beaker or wide-mouthed bottle which should be filled up with water, and after being thoroughly stirred or shaken up, the material should be allowed to settle for *thirty seconds* only, and the supernatant fluid and its floating particles poured off into a large vessel; this process should be repeated three or four times, and will give the heaviest density of sand and Polycystina. Repeat this process with the matter in the large vessel, allowing it to settle for *two-and-a-half to three minutes*, and the density containing the small Polycystina will be obtained. Subject the remaining matter to like treatment, allowing it to settle in six inches of water for 20 minutes, and the density consisting of the debris of Polycystina and of Diatoms will result. Now boil each separate sediment in nitric acid for fifteen to twenty minutes, remove all trace of acid by repeated washings, and finally boil each density in a weak solution of bi-carbonate of soda in a test-tube of large capacity for an hour; this will remove all flocculent matter, and, after repeated washings, perfectly clean Polycystina will be obtained. The heaviest density consisting of sand and the largest Polycystina should be placed in a test-tube with about three inches of water and subjected to rotatory motion, this will cause the Polycystinous shells to rise above, and to free themselves from

the sand, and they can be poured off into a wide-mouthed bottle or beaker, the sand being left at the bottom of the test-tube. This latter process should be carefully conducted and repeated several times in order that no large and perfect shells may be left among the sand. Each density should then be bottled in distilled water. Polycystina may be mounted in Balsam—in the same manner as Diatoms—or "dry." Beautiful slides can be produced by calcining the shells upon a piece of thick platinum foil, or in a small platinum capsule, and mounting them "opaque." The neatest and best method of preparing such slides is to make a disc half an inch in diameter in the centre of a slip, allowing it to harden for some days. A half-inch cover is then to be cleaned and a sufficient quantity of Balsam, thinned with turpentine, put upon it; the Polycystina are then to be placed in the Balsam in sufficient quantity to form a surface over the cover when evenly spread upon it; the cover with the Polycystina is then to be put aside (as recommended with Diatoms) for 12 or 24 hours in order that the Balsam may thoroughly permeate the forms and all air escape; the Balsam is then to be hardened by gentle heat, as already described, and the cover is to be laid upon a slip, with the Balsam upwards, and held over the flame of a Bunsen burner until the Balsam is liquified; the Polycystina are then to be evenly spread upon the cover by means of a needle; when the Balsam is cold a small drop of Benzole-Balsam is to be placed upon its surface and a clean half-inch cover to be warmed and carefully lowered upon the Balsam. The Polycystina will thus be mounted between two covers; now, turn the "mount" over, so that the under surface of the lower cover shall be upwards, and coat this with asphalt, put the mount aside for a day or two, in order to allow the asphalt to become thoroughly hard, then put upon the asphalt disc on the slip a small drop of (cold) "French Liquid Glue," place upon this the asphalted under surface of the "mount," and when the glue is quite dry finish off the slide with either asphalt or white zinc cement.

Reviews.

The Students' Manual of Histology. Third Edition. By C. H. Stowell, M. D. Entirely rewritten; newly illustrated; and greatly enlarged. Large 8 vo., 370 pages, 178 illustrations. 1884. C. H. Stowell, publisher. Price, $3.50. For review see advertising page IV.

American Medicinal Plants. The history, preparation, etc., o the American plants used as homœopathic remedies. By Chas. F. Millspaugh, M. D., of Binghamton, N. Y. Published by Boericke & Tafel, New York.

It is a fact that only comparatively few physicians in the country are capable of recognizing the plants that grow within their daily ride. Such a work as this will be of incalculable aid to all such as desire to thoroughly understand the agents they use in their efforts to cure diseased conditions. To the city practitioner, who is so shut in by high walls that he only occasionally gains glimpses of the beauties without, the work will be a real treasure for its artistic merits alone. The author has drawn and colored each plant by his own hand, from the specimens as they stood in the soil. There is also a full description of the plant, the parts used, the physiological effects, etc. The folio before us contains thirty full-page colored plates and one hundred pages of text. When finished the work will contain one hundred and eighty colored illustrations, with full text. Every homœopath will soon have the work we are sure.

Courier-Review Call Book.

This is a physicians pocket reference book and visiting list, as arranged and prepared by E. M. Nelson, M. D., editor of the St. Louis Courier of Medicine. It is published by J. H. Chambers & Co., of St. Louis. There are no less than twenty-six pages filled with useful tables of doses, signs, formulæ, tests, etc. It is compact and in a convenient form to be readily carried in the pocket.

Minutes of the Central New York Conference. Large 8 vo. pp. 132.

This whole work was arranged and over half of it written

by one man, the secretary, Rev. M. S. Hard, of Canandaigua; half of the whole number of pages is in small type; and fifteen pages are covered with tables of statistics, thirty-one columns in width, with several rows of figures in each column. The amount of clerical work on each page is about equal to twenty pages of ordinary print. *Yet, in just twenty-one days from the date of adjournment, and from the date of Mr. Hard's first stroke of the pen, the proceedings are in the hands of members.*

PRELIMINARY LIST OF THE PARASITIC FUNGI OF WISCONSIN. By William Trelease, of Madison, Wis. pp. 40. Price, 25 cents.

INTERNAL PARASITES IN DOMESTIC FOWLS. By Thos. Taylor, M. D., Washington, D. C.

ORGANISMS IN HAILSTONES.—Boyd Moss has, on two or three occasions during the last twelvemonth, collected a few hail-stones in a conical glass, so that anything contained in them subsided to the bottom as they melted, and has always found organized remains, but he never had any idea of the quantity of these till a recent hail-storm. He figures the contents of a single hailstone (about $\frac{1}{4}$ in. in diameter), which he placed, with every precaution as to cleanliness, between the glasses of a live-box. These consisted of diatoms, a living *Amœba*, a spore, probably of fungus, pale yellowish bodies like ova about 3 to 4 times the diameter of a human red blood-corpuscle (at least 40 of these), and a dark brown mass with small bright spherules. The *Amœba* and one diatom were in active movement. The spore [?] he calls the attention of microscopists to, and would be glad to hear if they are acquainted with it, "as it is one of several of the same kind which he discovered among the fibres of the heart of animals dead from cattle disease in India in 1870, and described in the *Monthly Microscopical Journal* for December of that year, p. 312."—*Royal Mic. Jour.*

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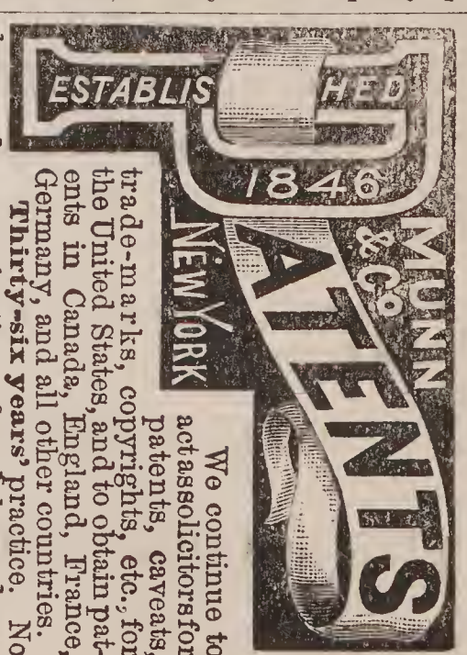

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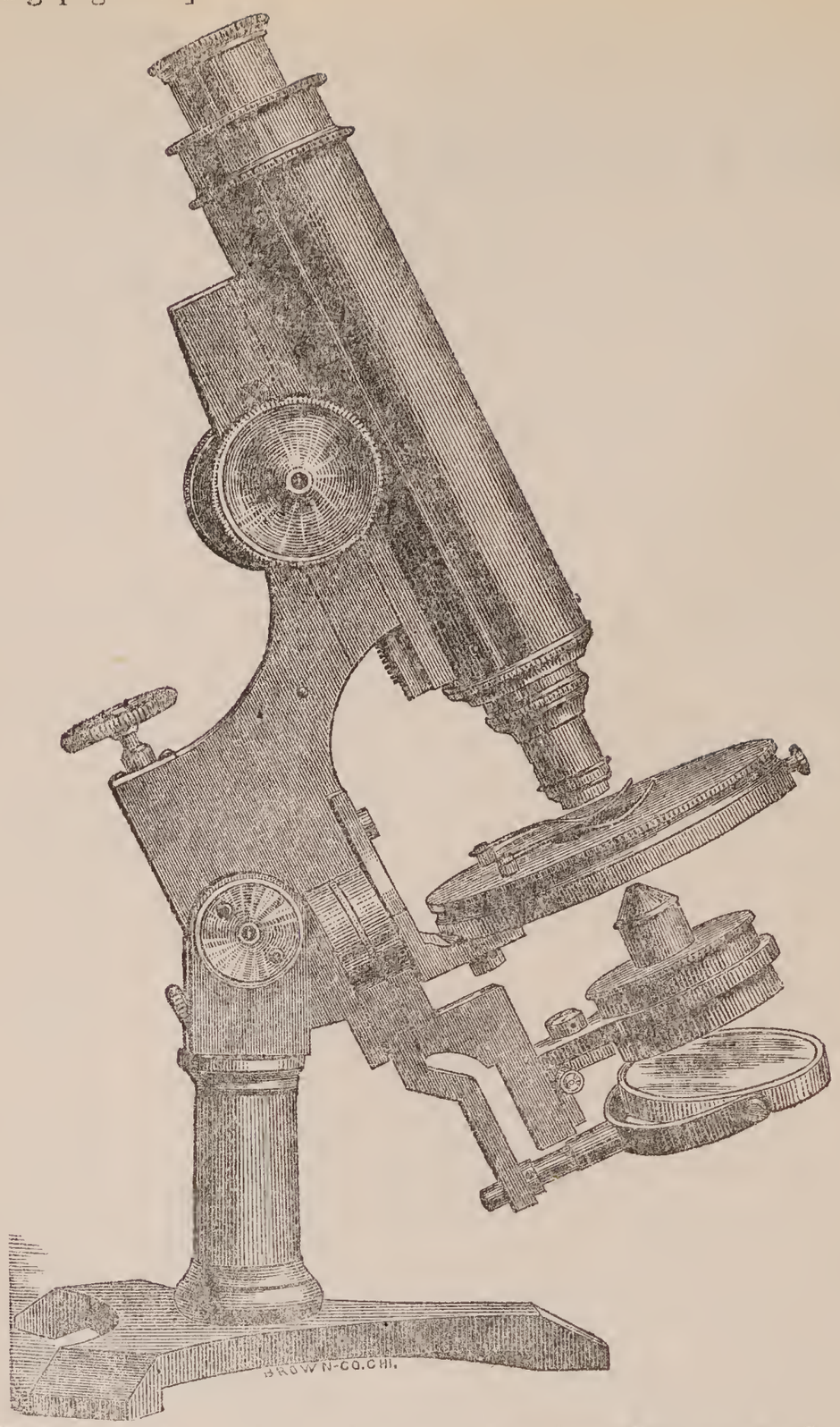

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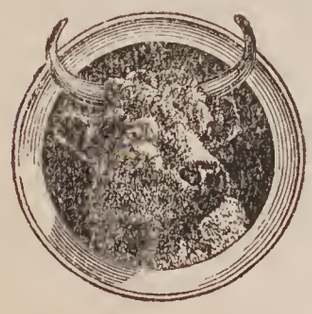

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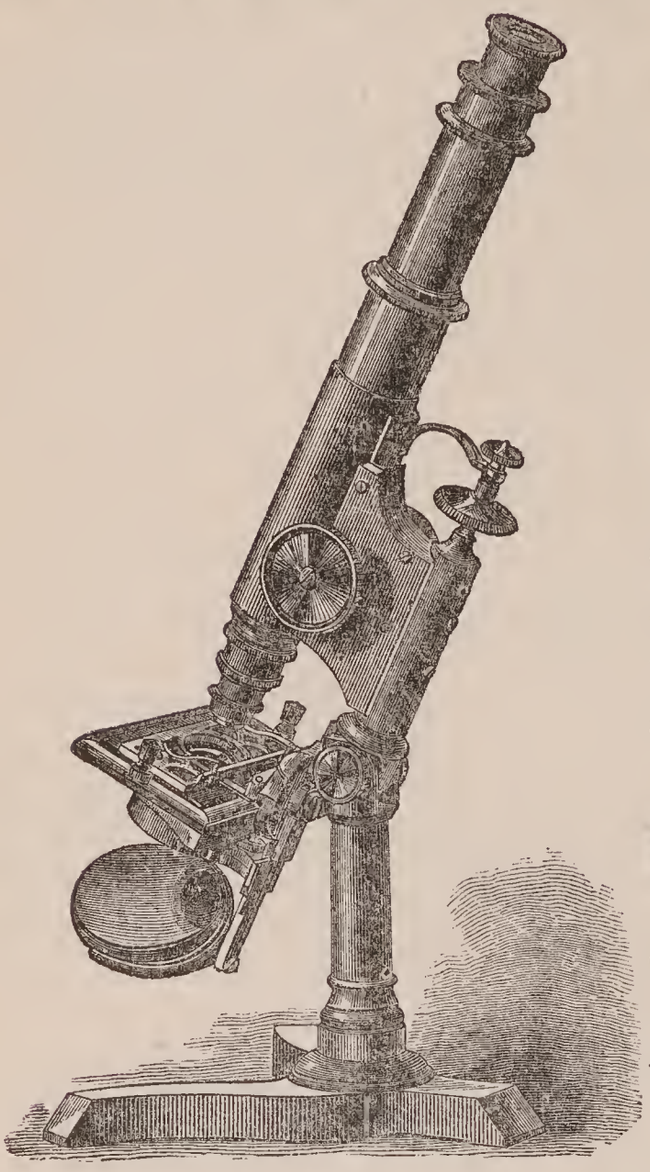

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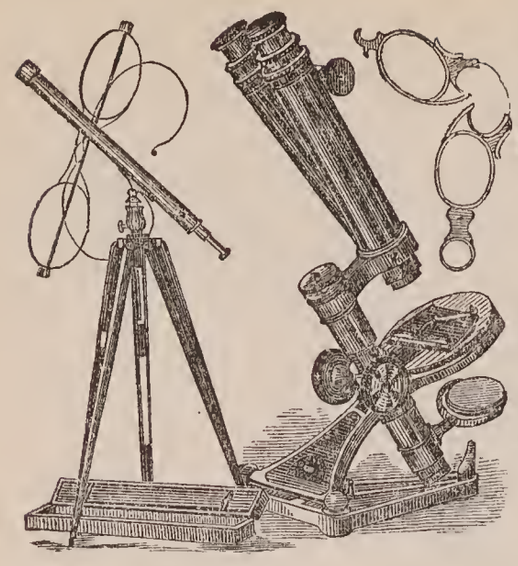

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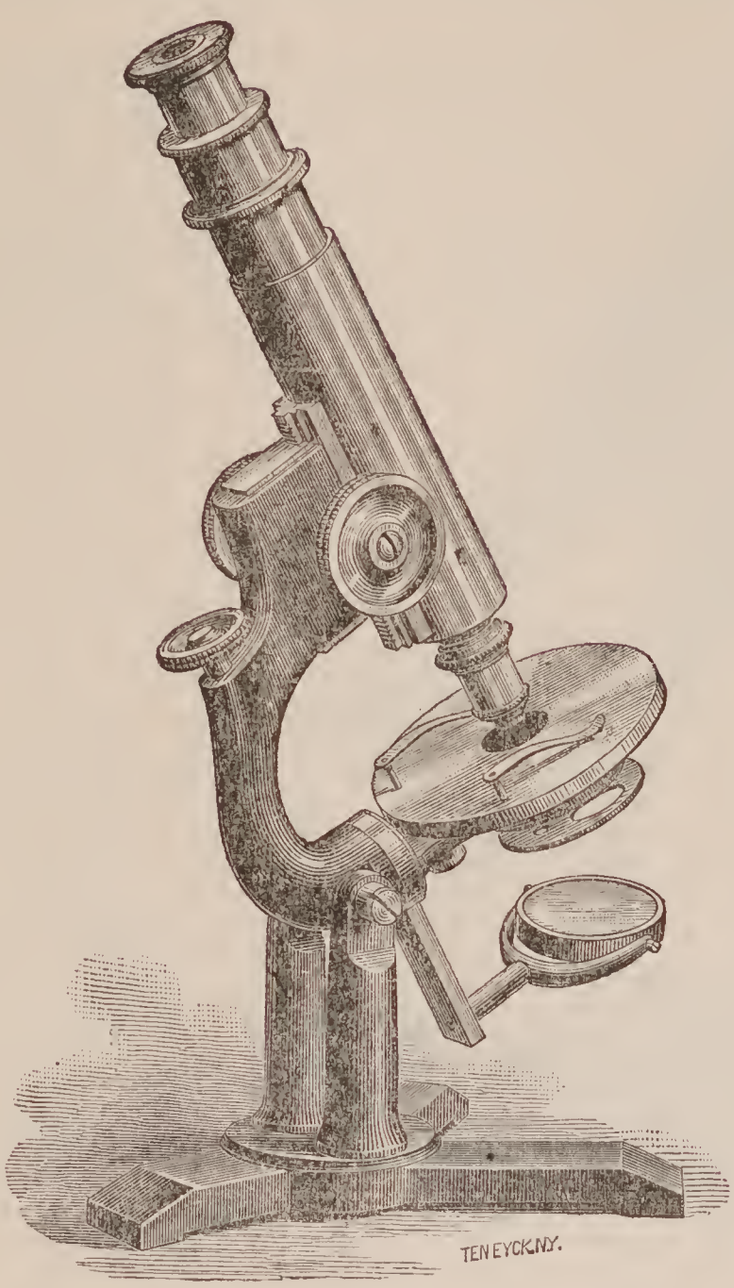

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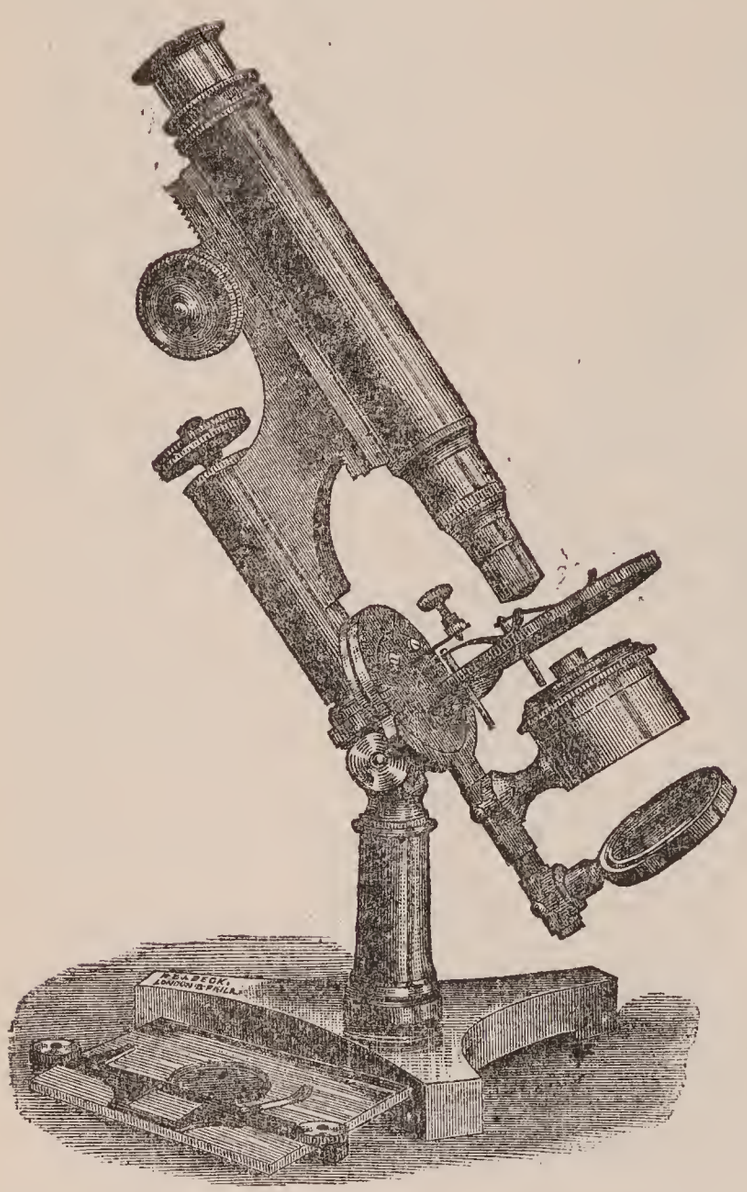

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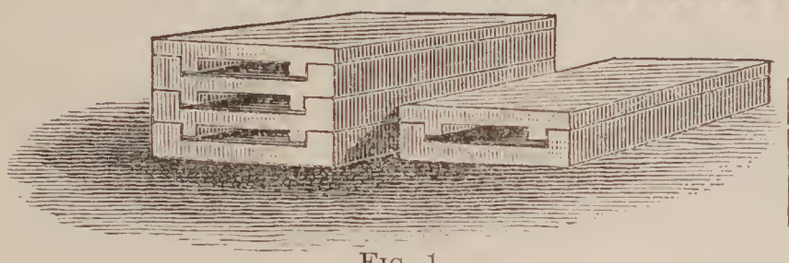

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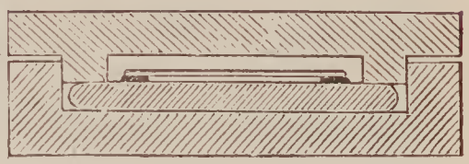

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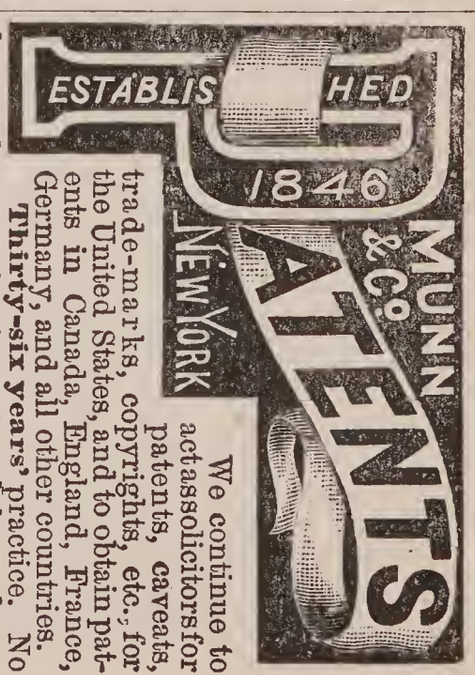

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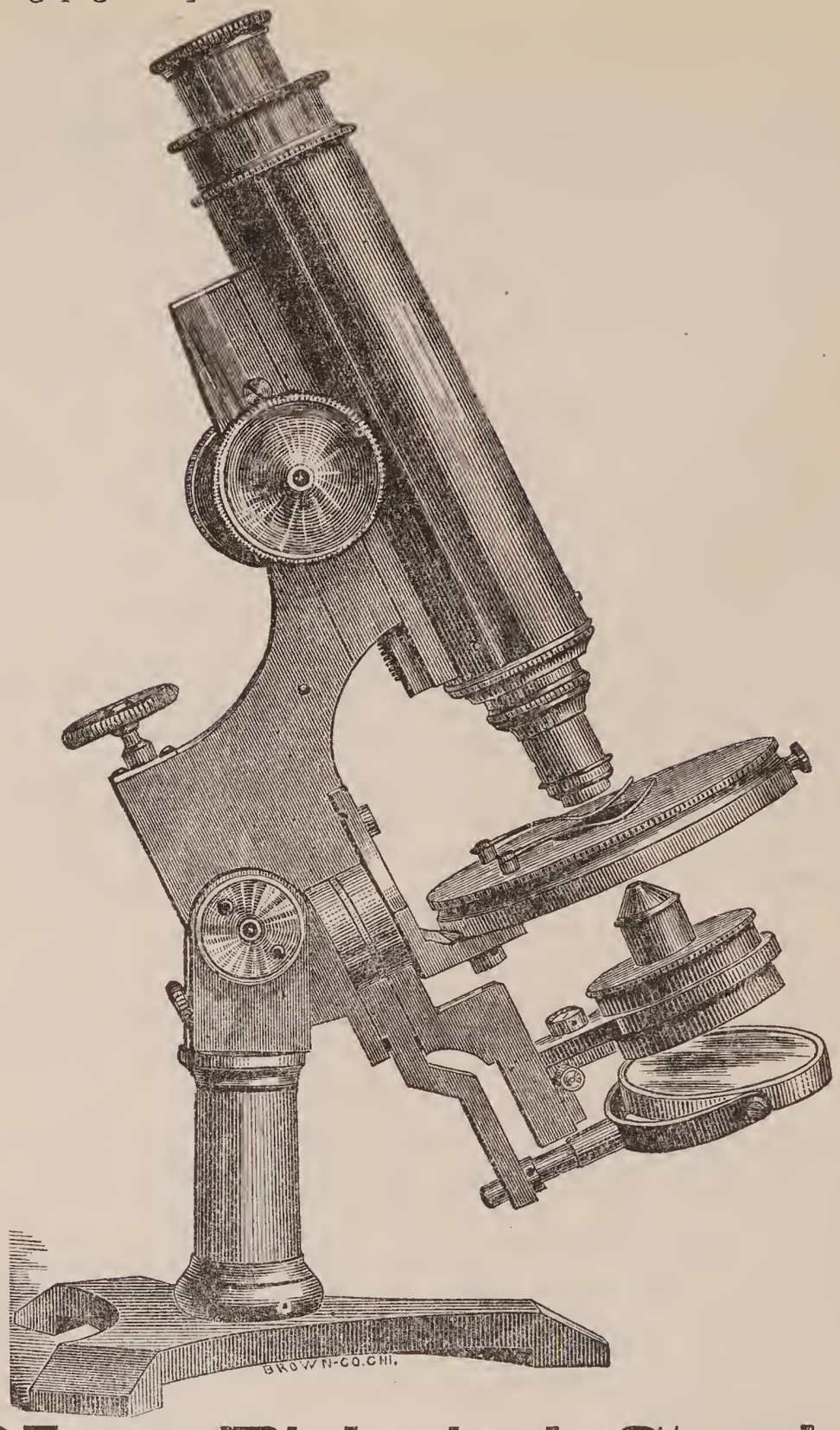

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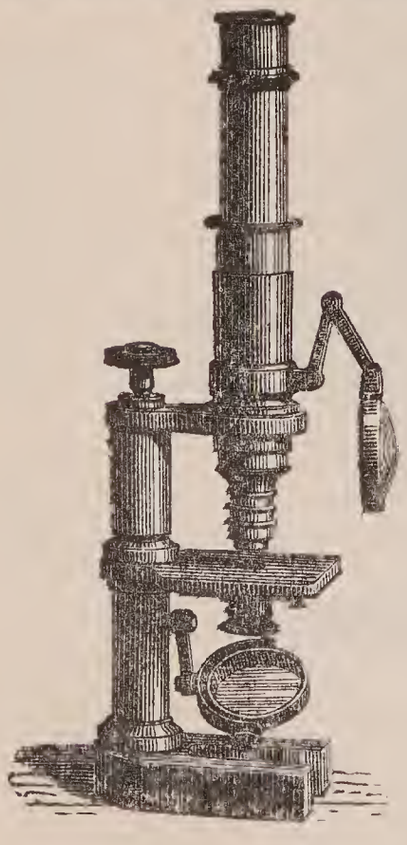

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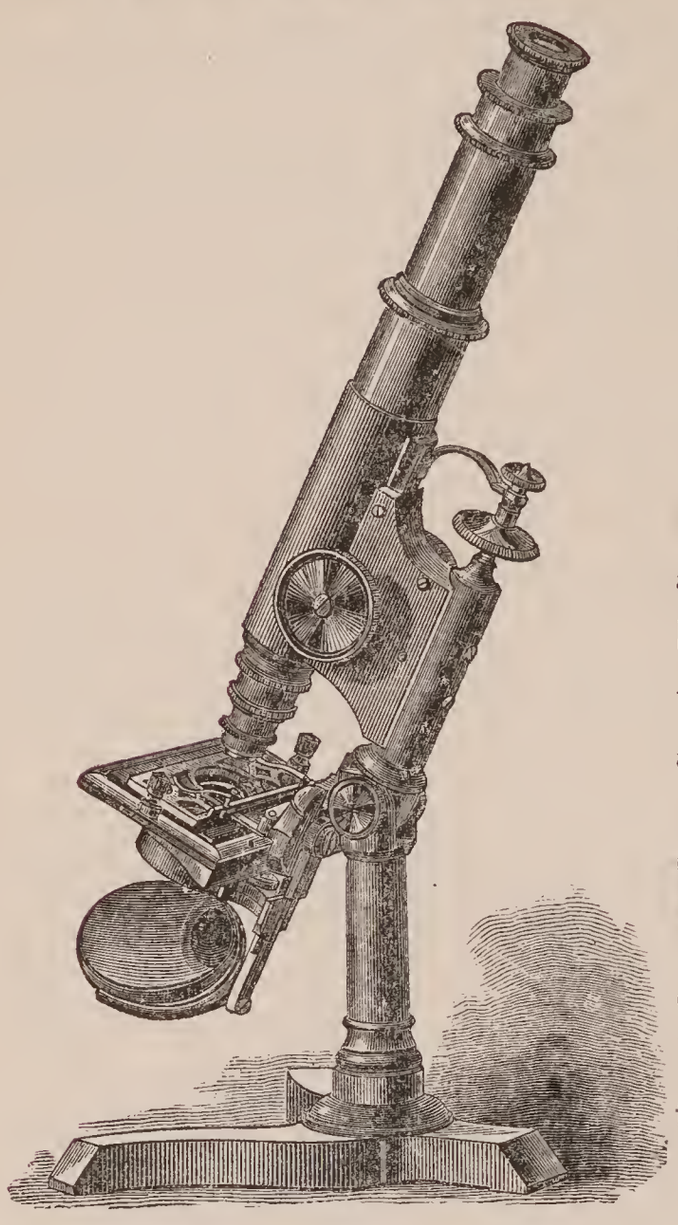

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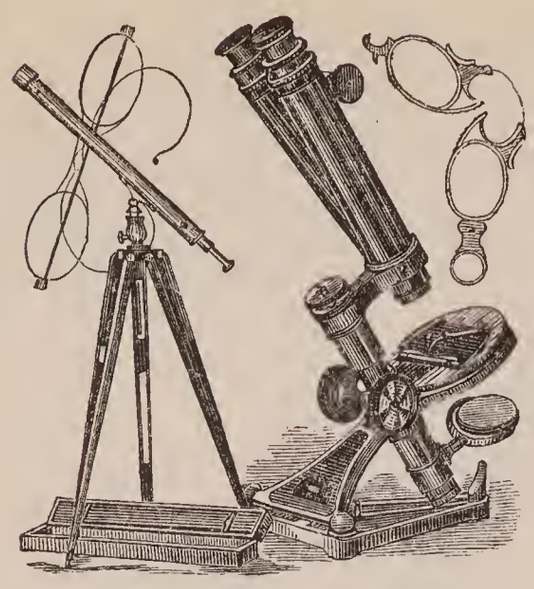

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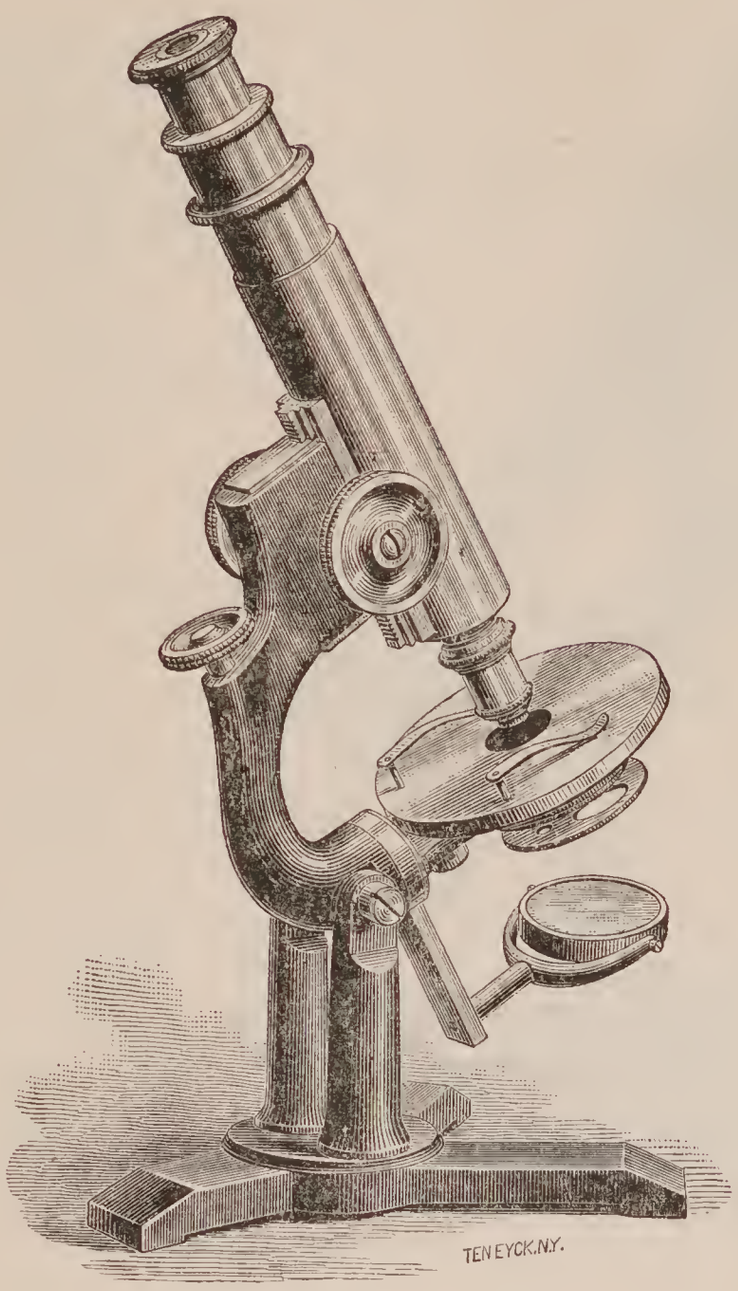

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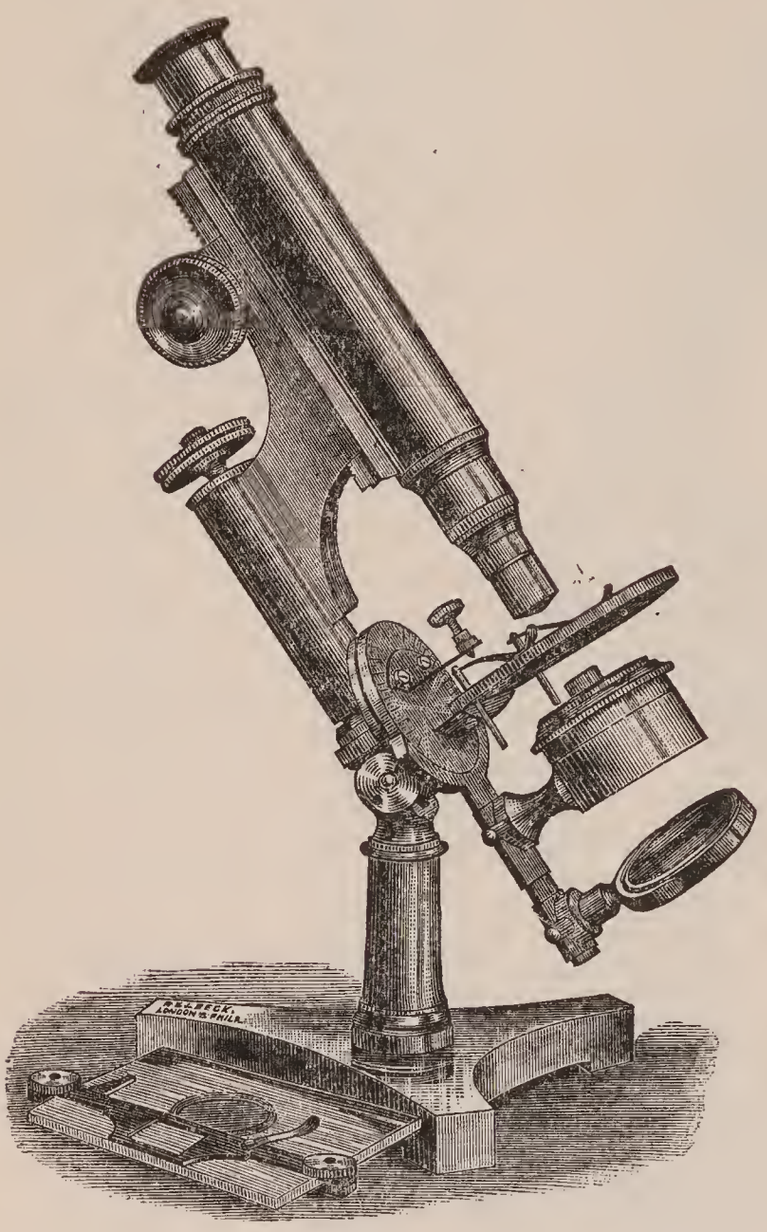

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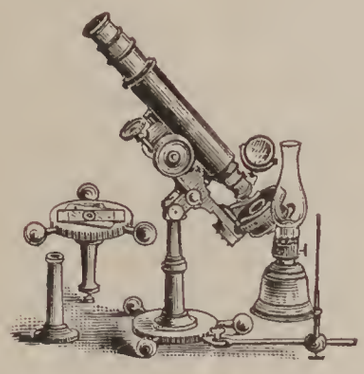

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.

Studies in Histology, Injecting..... 49
An Animal or Plant..... 56
The Congress Nose-Piece..... 58
The Measurement of Blood-Corpuscles.. 60
White Zinc Cement..... 62
Our Third Annual Soiree..... 63
How to Keep Living Infusoria..... 64
American Society of Microscopists..... 64
The Frogs..... 65

EDITORIAL DEPARTMENT:

Our New Publishers..... 65
Our New Advertisers..... 66
The Microscopical Bulletin..... 66
Science Record..... 66

PAGE.

Delay of Journal..... 66
Cole's Publications, of London..... 67
The Facility Nose-Piece..... 67

EDITORIAL EXCERPTS:

The Germ of Swine-Plague..... 67
The Bacillus of Tubercle..... 68
The New Blood-Corpuscle..... 68

REVIEWS:

The Wonders of Plant Life Under the Microscope..... 70
The Kingdoms of Nature..... 70
World-Life and Comparative Geology.... 71

Exchanges..... 72

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Maltine will convert 33 times its weight of starch at 140° Fahr. in 16 minutes.

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"'Maltine' far exceeds in diastatic power any of the six preparations of malt which I have examined. Ten grains of 'Maltine' warmed at 63-65° C., for fifteen minutes with 125 grains of starch in five oz. of water in the form of paste, formed from the starch 7.43 grains of sugar, calculated as dextrose. Ten grains of Trommer's Extract of Malt, under similar conditions, formed during the same length of time 1.47 grains of sugar, calculated as dextrose."

Prof. ATFIELD, F. R. S., F. I. C., F. C. S., etc.:—

Oct. 8, 1883.—"I now find that 'Maltine' contains from three to five times as much diastase as any Extract of Malt in the market."

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Rush Medical College, Chicago, Dec. 13, 1883.—"'Maltine' will convert a much larger amount of starch into sugar than any of the Extracts examined, and I therefore regard it as the best Malt preparation with which I am acquainted."

Prof. ALBERT B. PRESCOTT, M. D., F. C. S.:—

Univ. Mich., Jan. 7, 1884.—"'Maltine' converts 33 times its weight of starch. Trommer's Extract of Malt converts 16 times its weight of starch."

Prof. R. DORSEY COALE, Lecturer on Chemistry and Toxicology:—

Univ. of Maryland, Baltimore, Md., Feb. 7, 1884.—"I obtained in the open market, from four different wholesale dealers in this city, samples of 'Maltine' and Trommer's Extract of Malt and have subjected them to chemical analysis to determine the relative diastatic value of these preparations. From result submitted, it will be seen that 'Maltine' is far superior in converting power. A given weight of 'Maltine' formed into sugar 1.819 gramme, while the same weight of Trommer's Extract Malt under exactly same conditions, formed .898 gramme.

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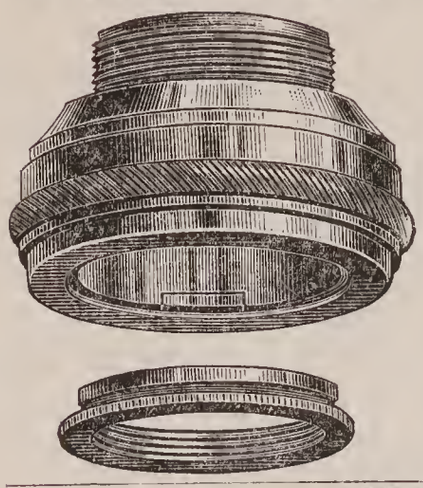

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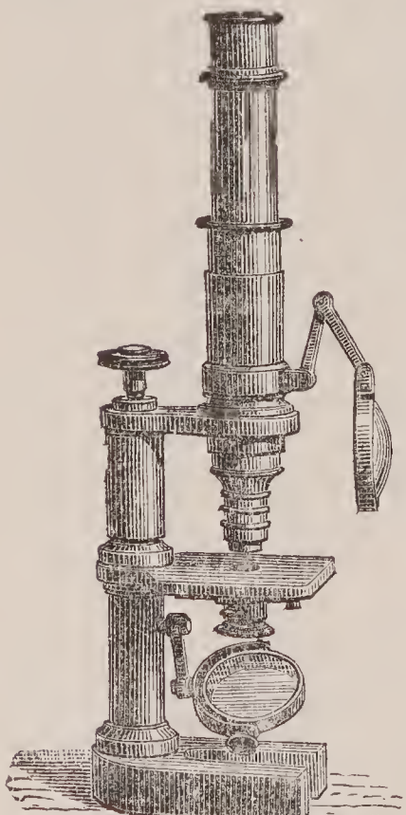

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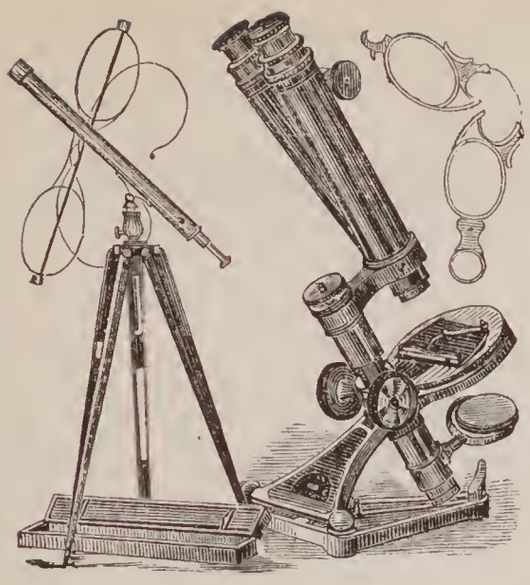

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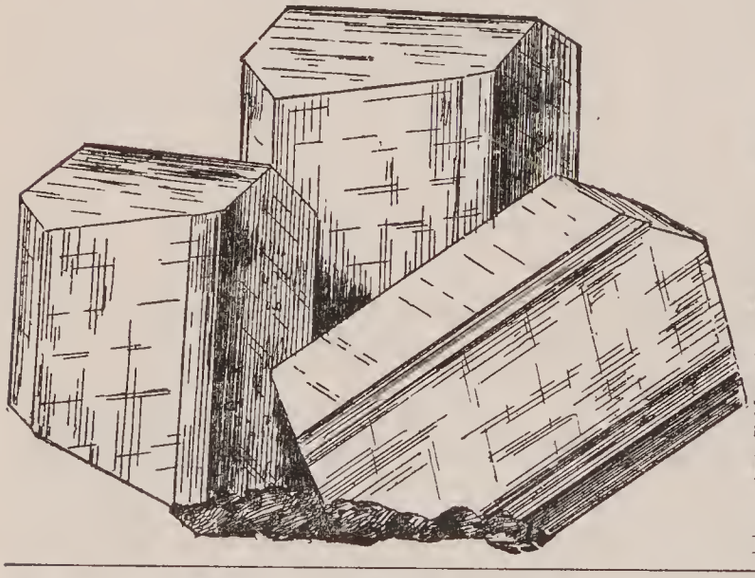

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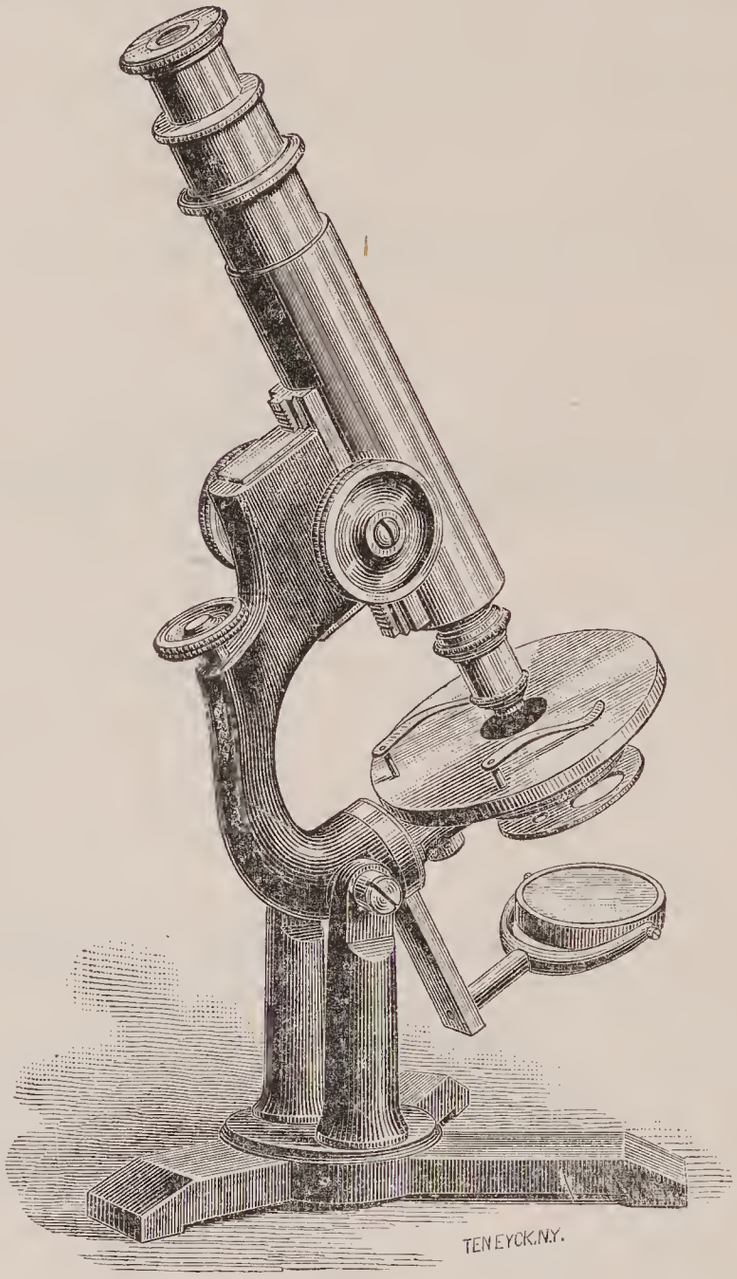

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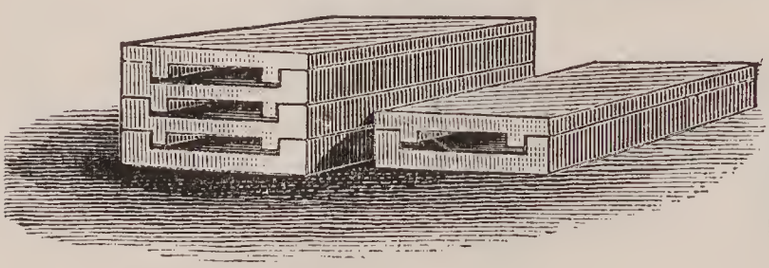
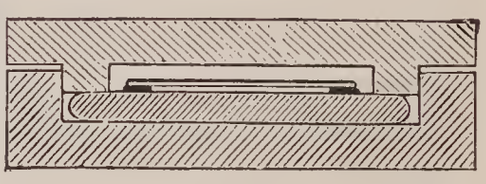


Fig. 1.



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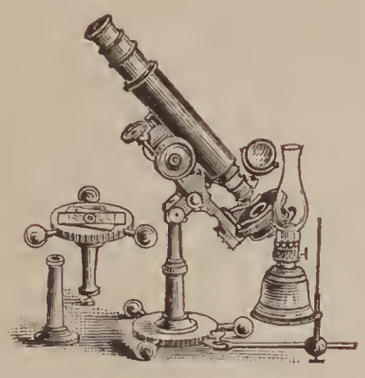

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.
Astasia Hæmatodes ... 73
Microscopy 150 years ago ... 74
The Bacillus of Glanders ... 77
How to Mount Casts ... 78
Bacillus Staining ... 79
Studies in Histology ... 80

EDITORIAL DEPARTMENT:
Calls from Messrs. Griffith and Lomb ... 87
The Subscription Price of Journals ... 87
Exchanging Names for Trichinæ ... 88
A New Journal ... 88

EDITORIAL EXCERPTS:
Dr. Gregg vs. The Germ Theory ... 89
The Decay of Teeth ... 90
An Electric Microscope ... 90

ITEMS:
The Study of Histology ... 90
Adulterated Pepper ... 90
Bacillus Tuberculosus ... 90
Organisms in Water ... 91
Mounting Diatoms in Series ... 91
Bi-Centenary of Bacteria ... 91
Bacilli of Tubercle ... 91
The Eyes Connected ... 91
Cicero Talking About Dentistry ... 92
Trichinosis ... 92
Cilia in the Human Kidney ... 92

REVIEWS:
Methods of Studying the Brain ... 93
School Hygiene ... 93
A Treatise on Starch ... 94
At the Doctor's Expense ... 95
Exchanges ... 96

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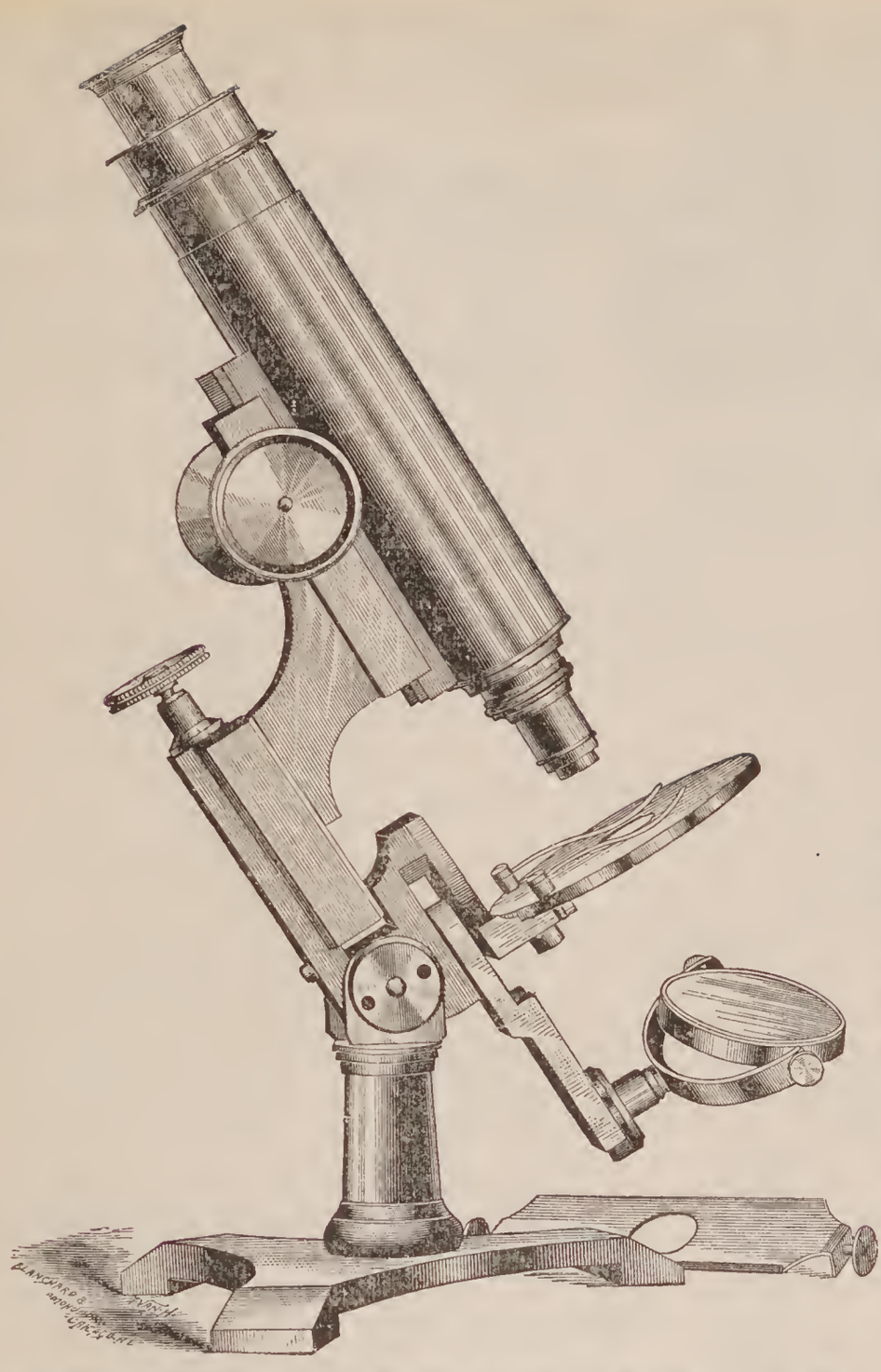

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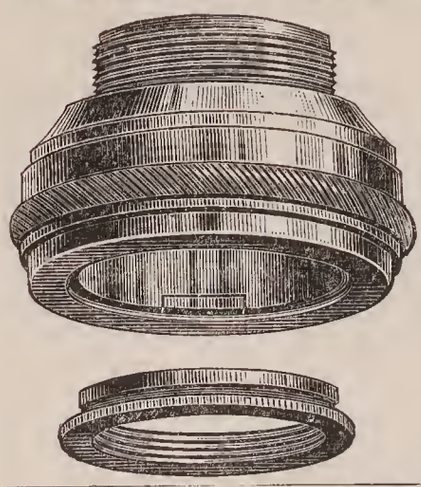

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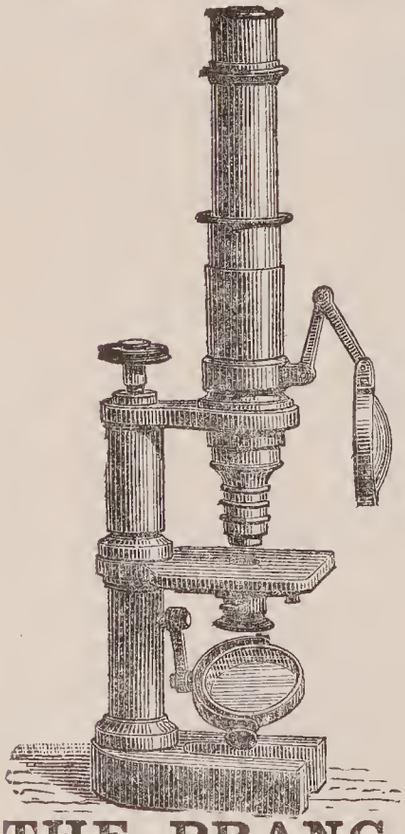

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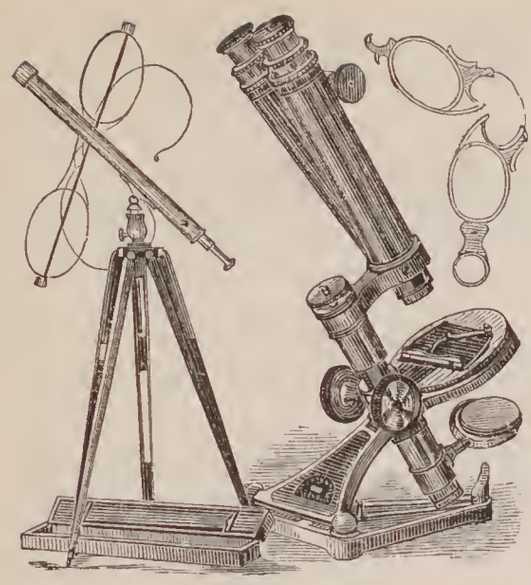

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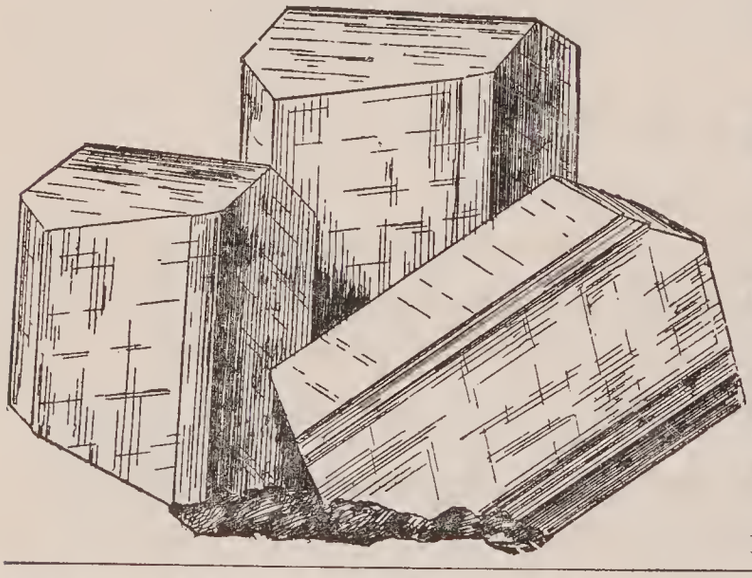

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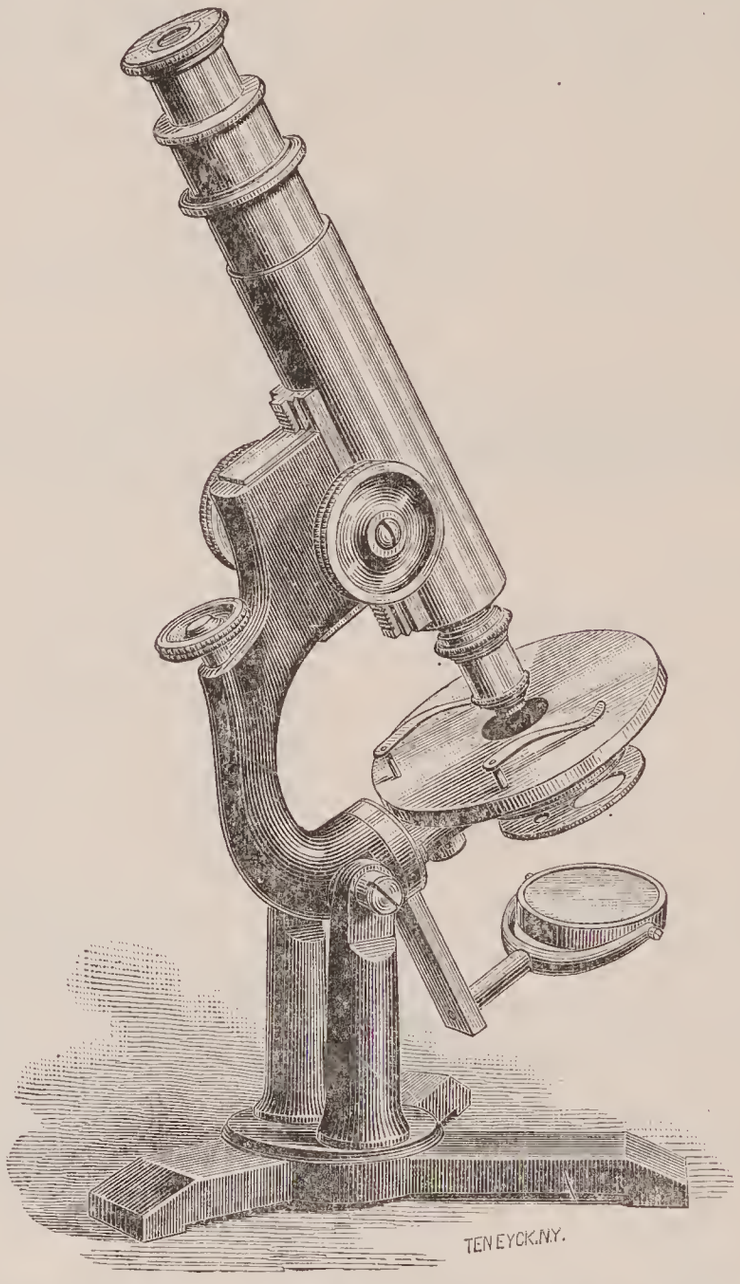

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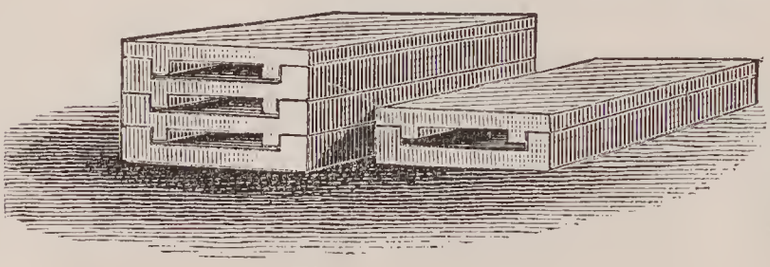
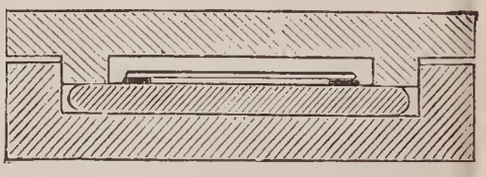


Fig. 1.



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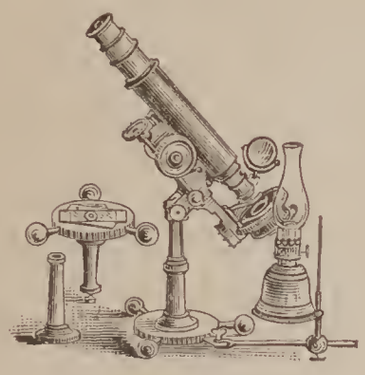

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.

Clematis Virginiana 96
Astasia *versus* Englena.....100
The McCalla Nose-Piece.....101
Tintinnidium Semiciliatum..... 102
An Editor's Life 105
A New Condenser.....105

SELECTIONS:

Eye-Pieces and Objectives.....107
Ode to the Bacillus.....112
The Present Position of the Germ Theory 114
A Ready Method for the Detection of the Bacillus Tuberculosis.....115

CORRESPONDENCE:

How to Prevent Beads of Moisture 117
How to Mount Desmids.... 117

REVIEWS:

Household and Farm Conveniences.....118
The Century.....118
The American Homœopathic Pharmacopœia 118
Exchanges 119, 120

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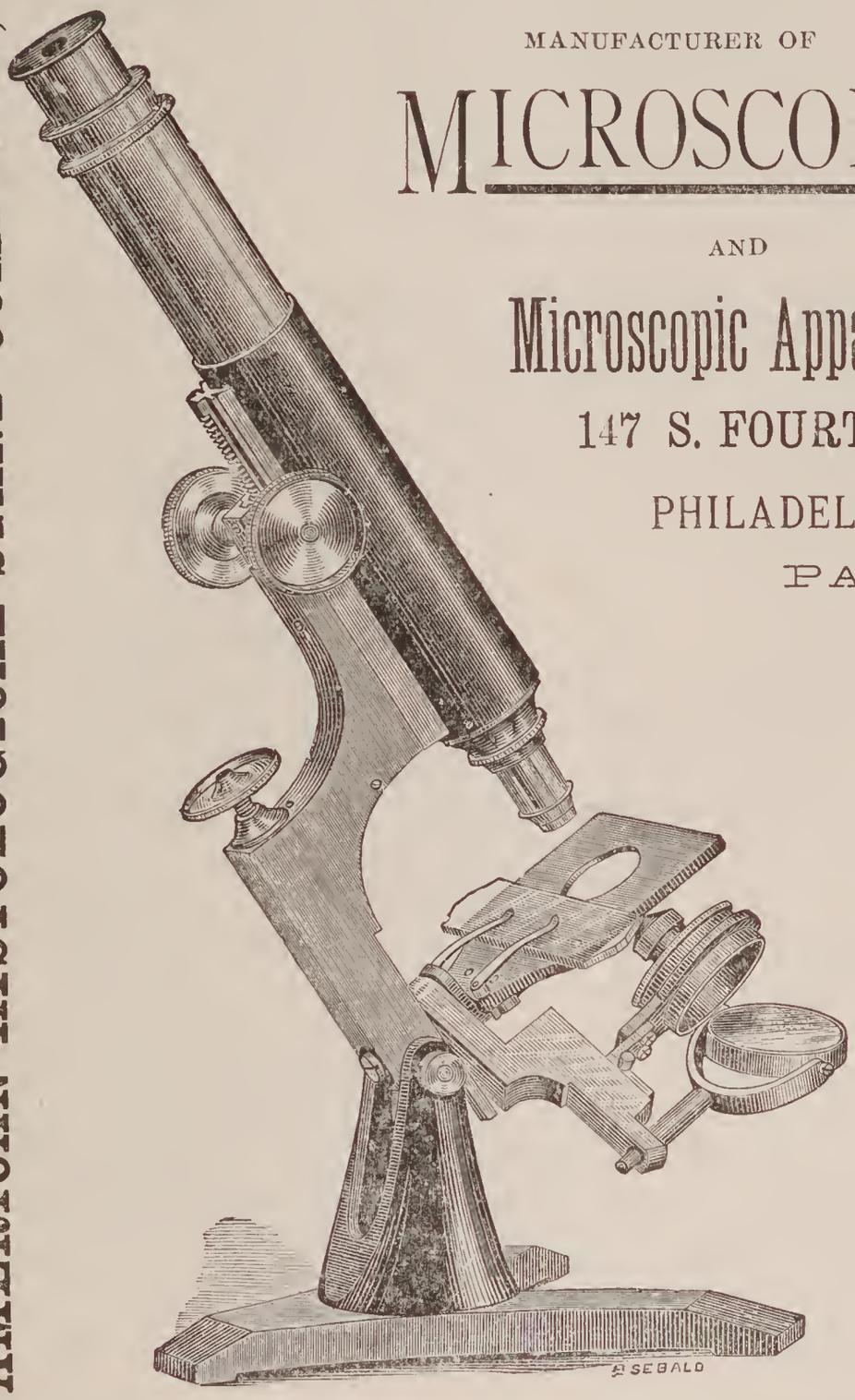

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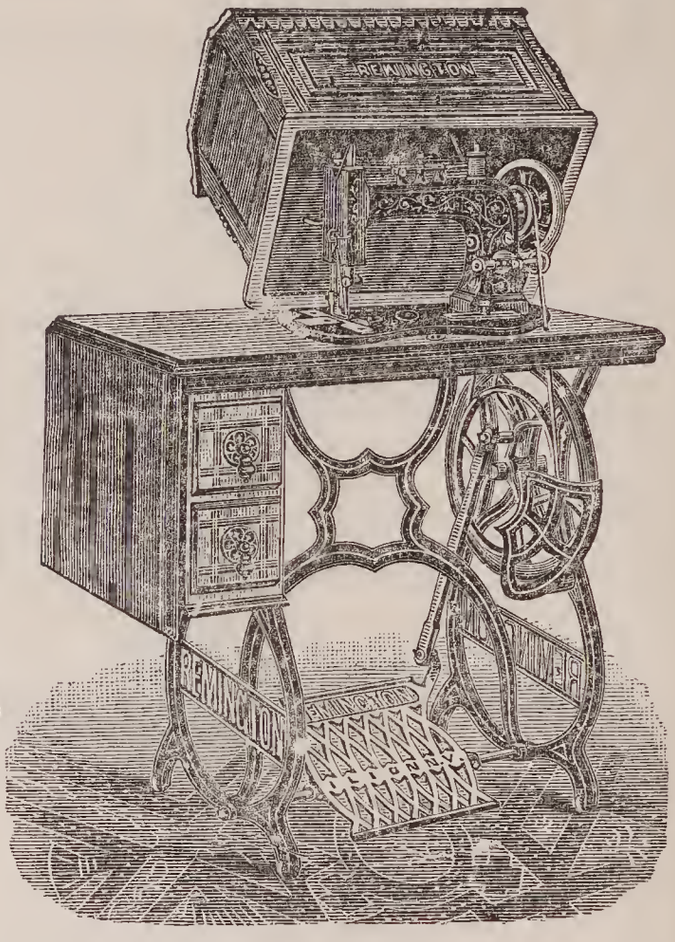

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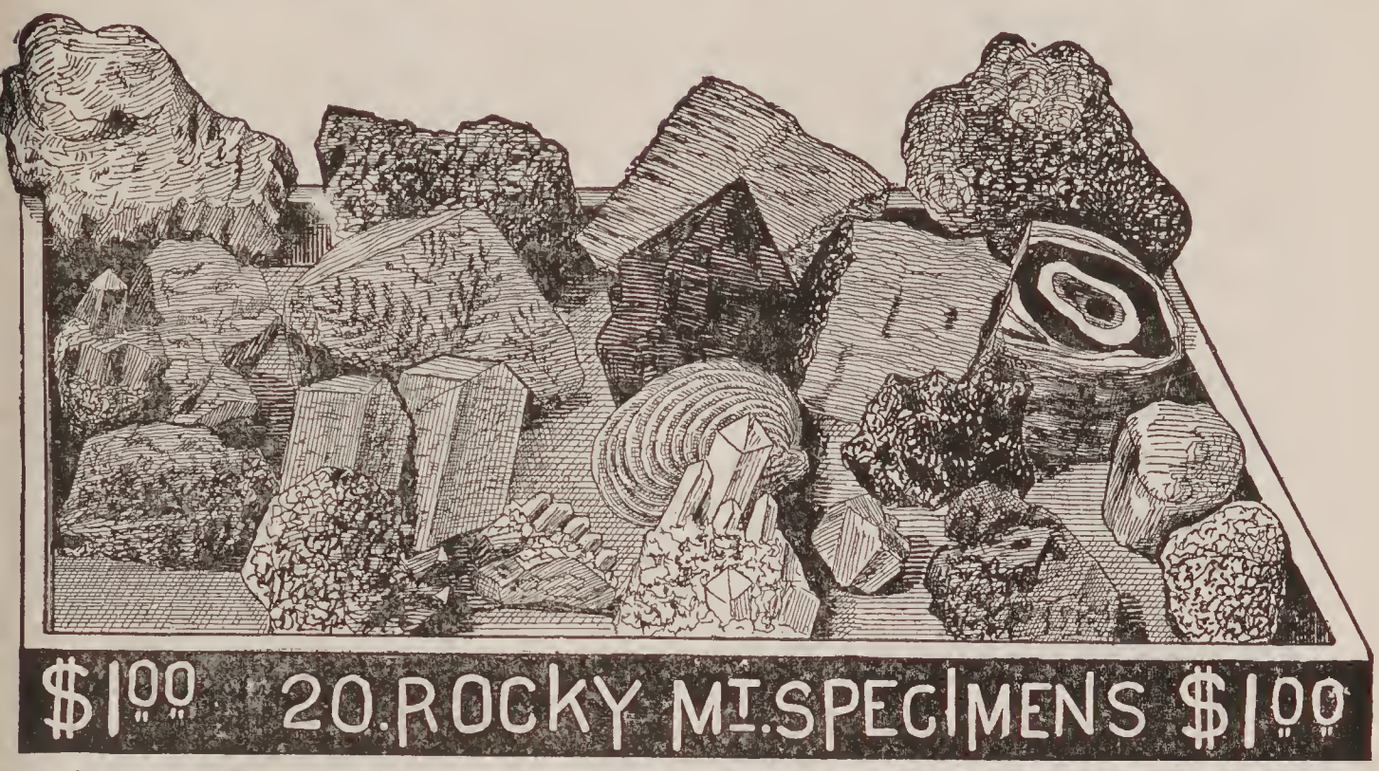

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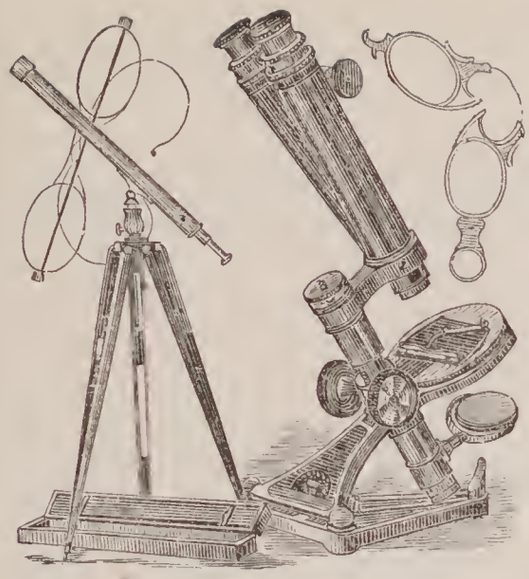

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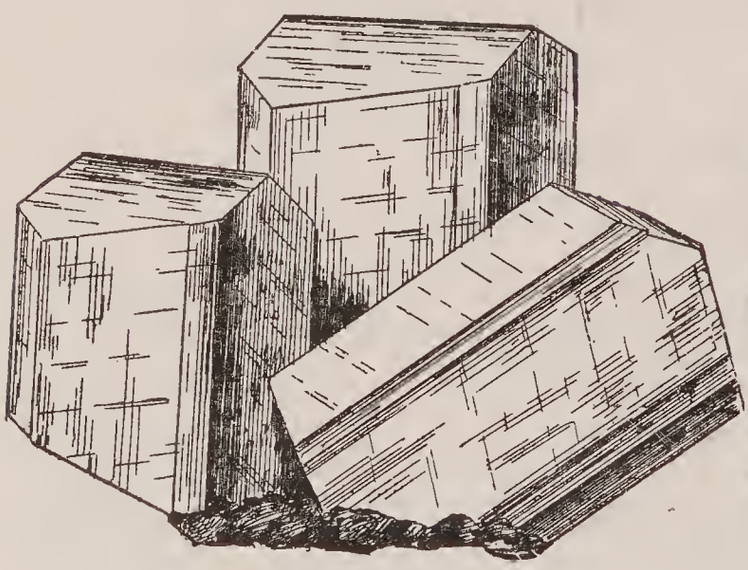

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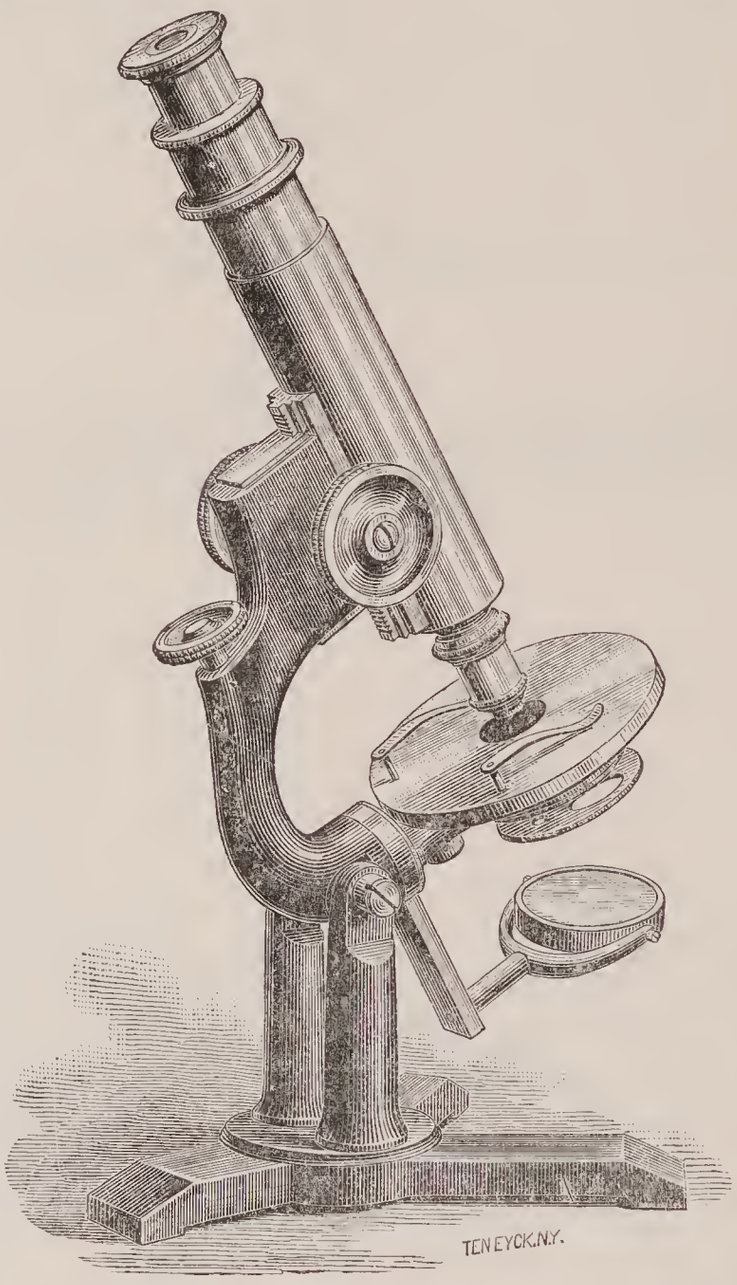

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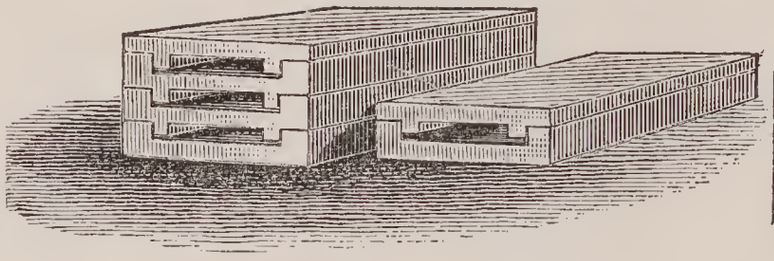

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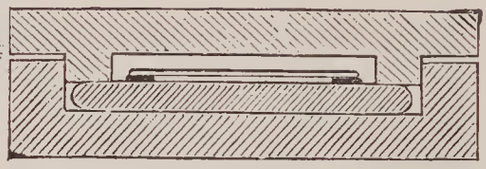

Fig. 2.

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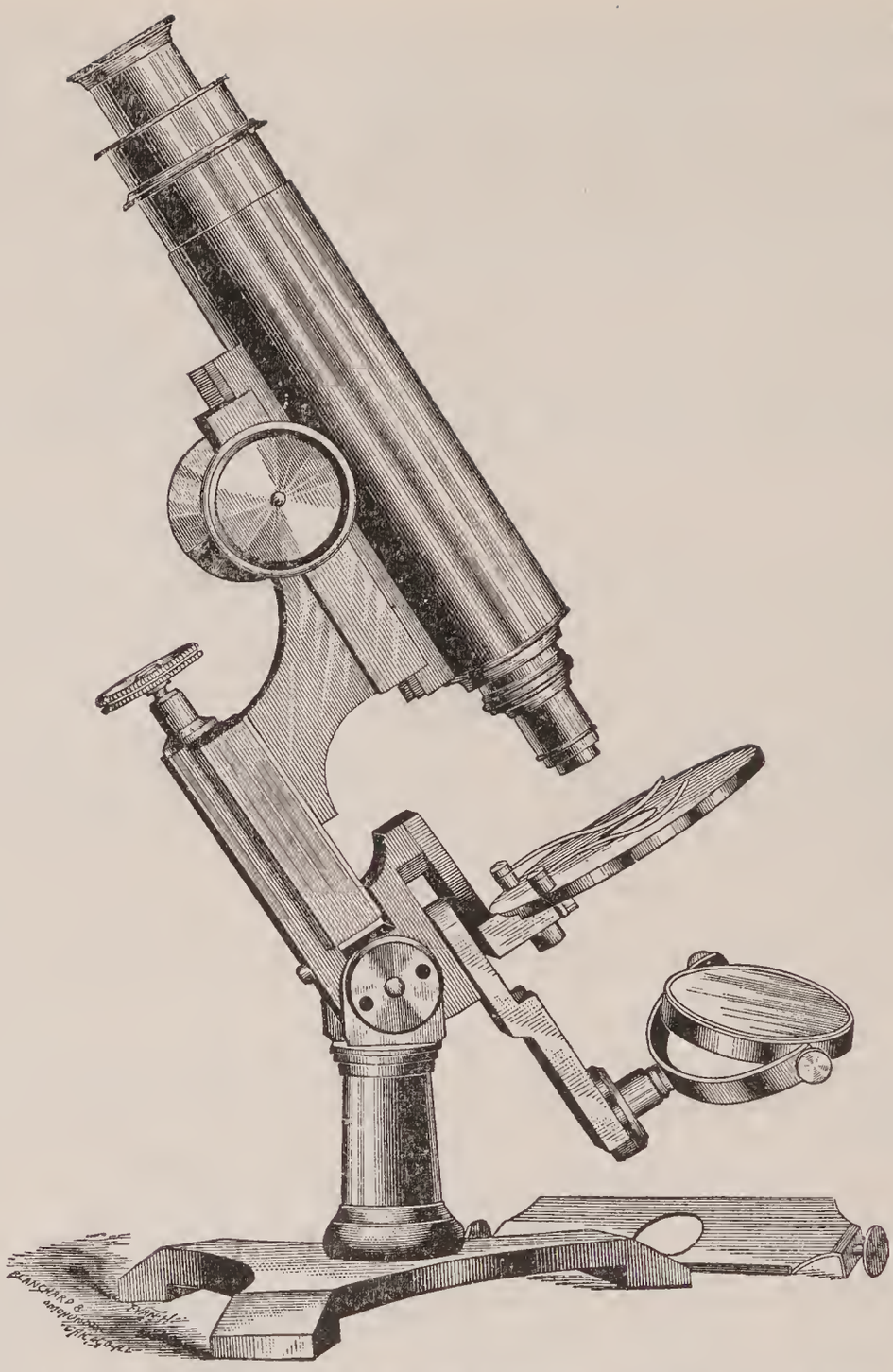

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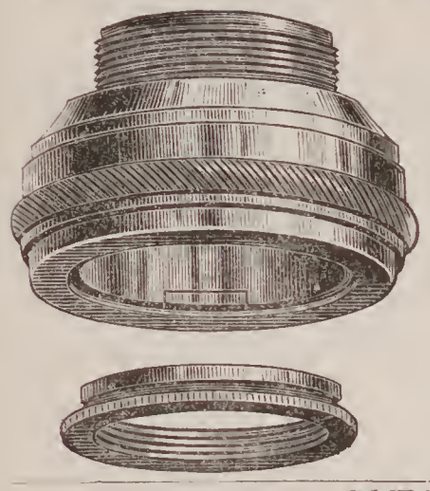

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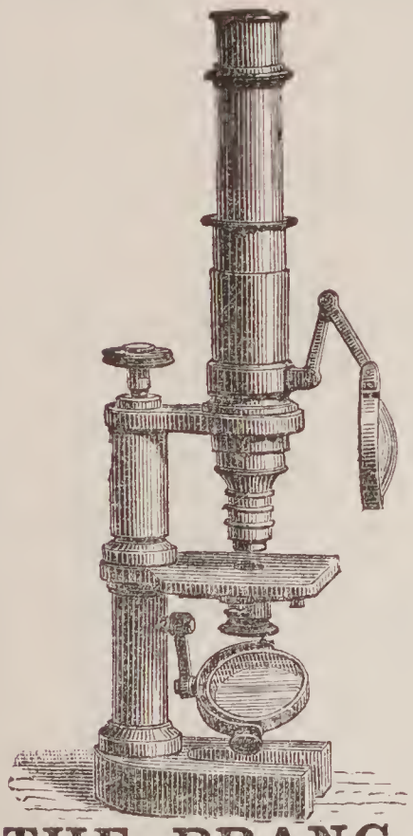

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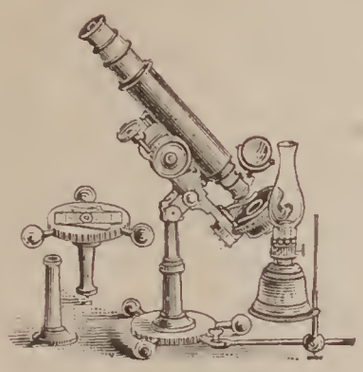

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.

Bacteria in Dentine....121
Studies in Histology....123
Paramæcium Aurelia....127
St. Louis Microscopical Society....129

EDITORIALS:
The Rochester Meeting....131
New Apparatus....131
A Conundrum....132
Reward Offered....132
CORRESPONDENCE:....133

ITEMS:
Disinfectants....134
Double Injections....134
What's in a Name?....134
The Wenham Button....134
The Beautiful Snow....134

PAGE.

A Pretty Slide....135
Tubercle Bacilli....135
Examining Heads of Insects....135
An Interesting Experiment....135
Mounting....136
Freezing Microtomes....137
Urinary Sediments....137
Tubercle Bacilli....137
Mounting Teeth and Bone....139
At the Doctor's Expense....140

REVIEWS:
Shakespeare as a Physician....141
Sexual Neurasthenia....141
Drugs of North America....142
Tour to Mackinac....142
Heart of the Continent....142
American Meteorlogical Journal....143
Exchanges....143, 144

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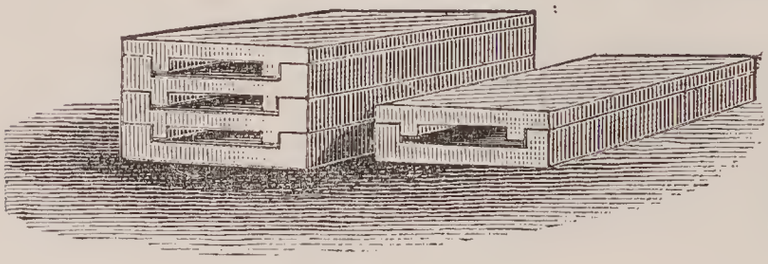

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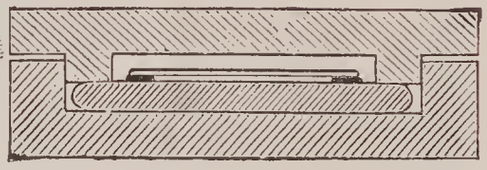

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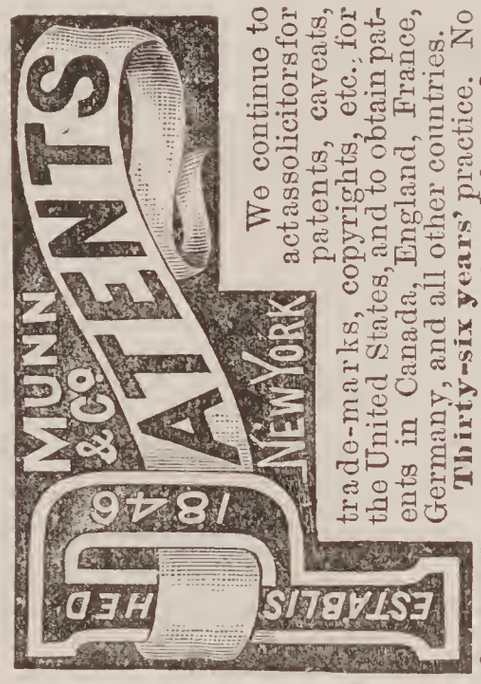

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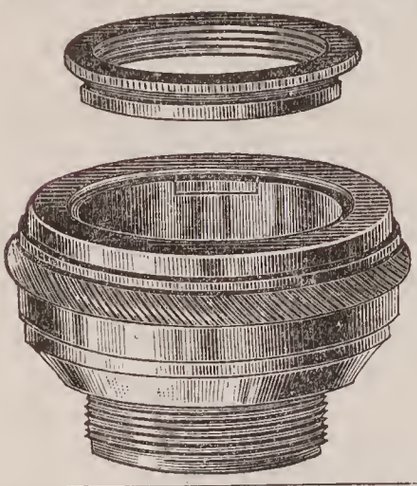

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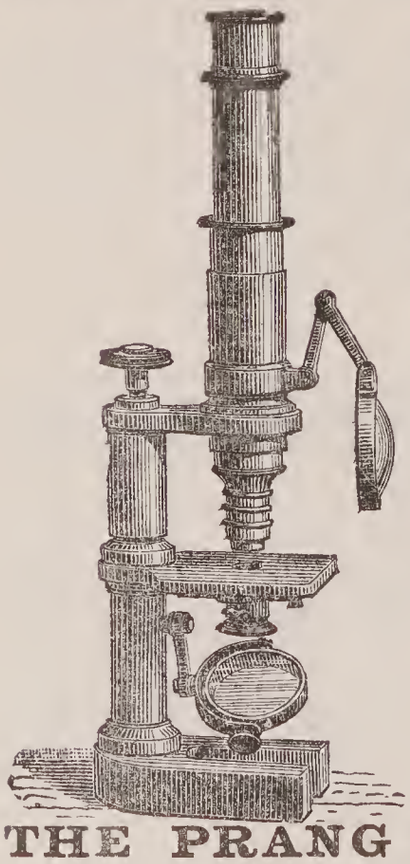

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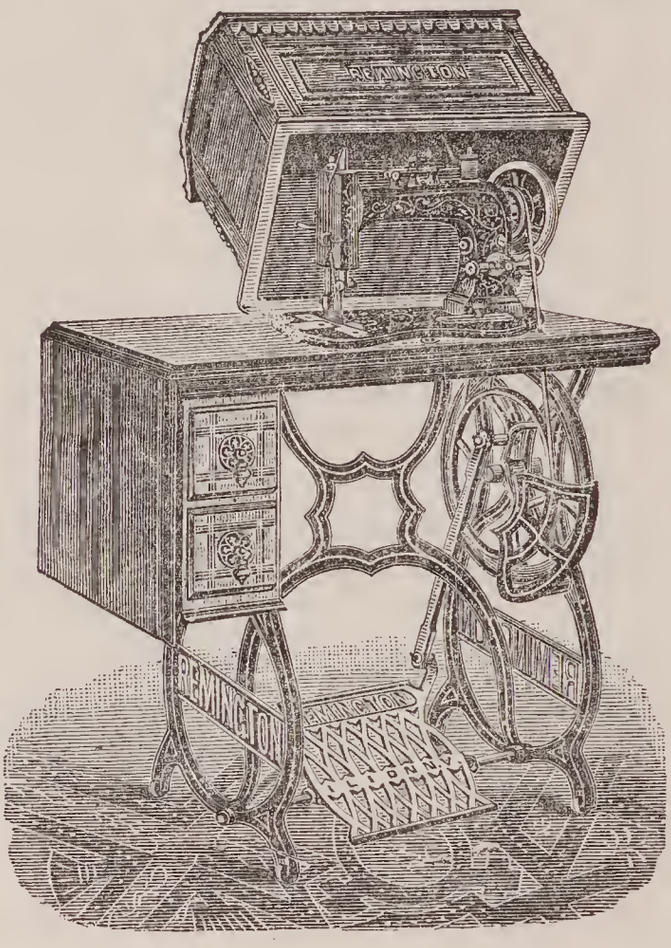

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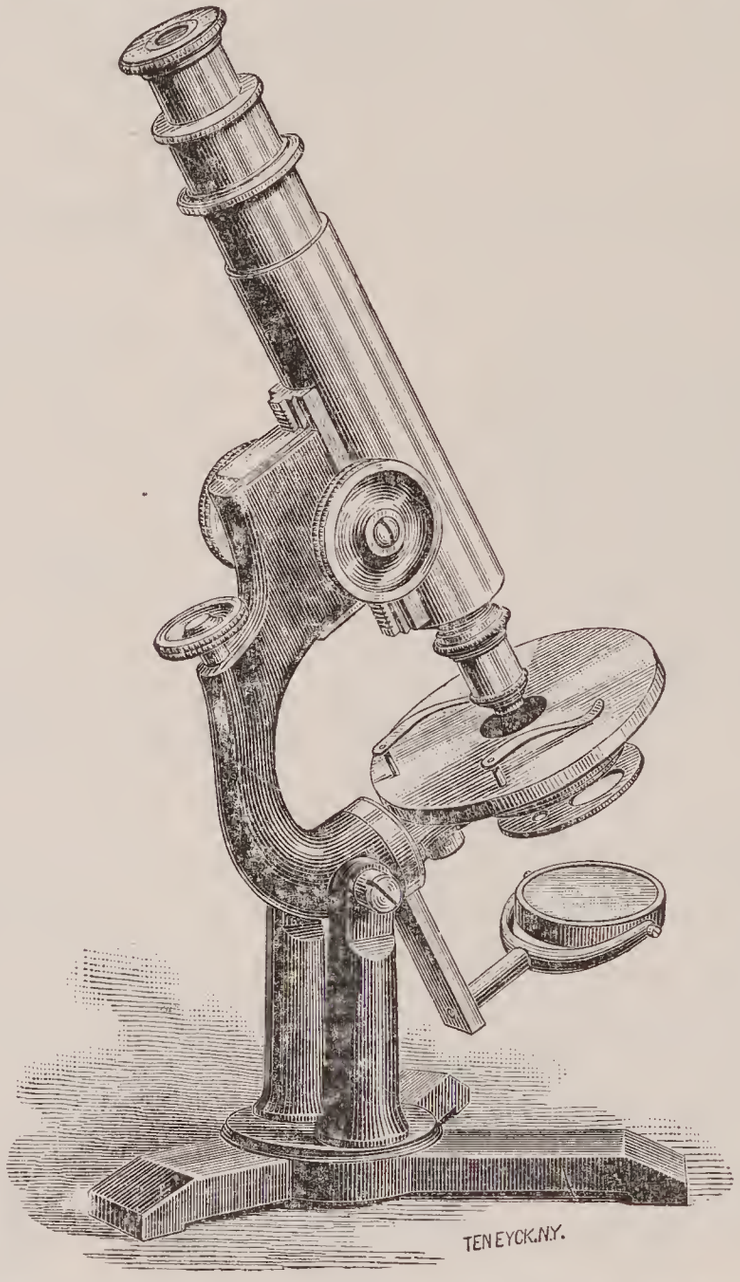

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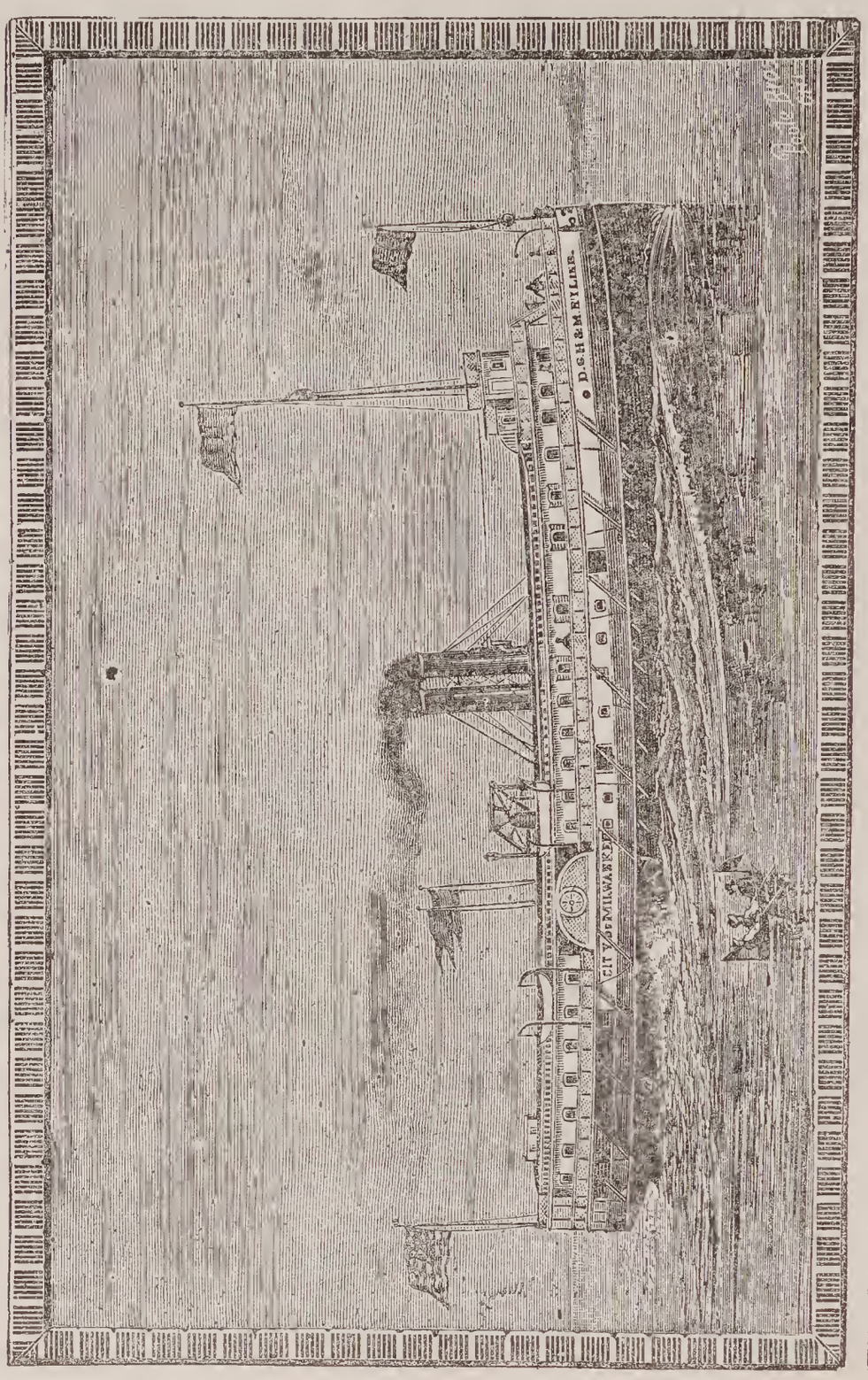

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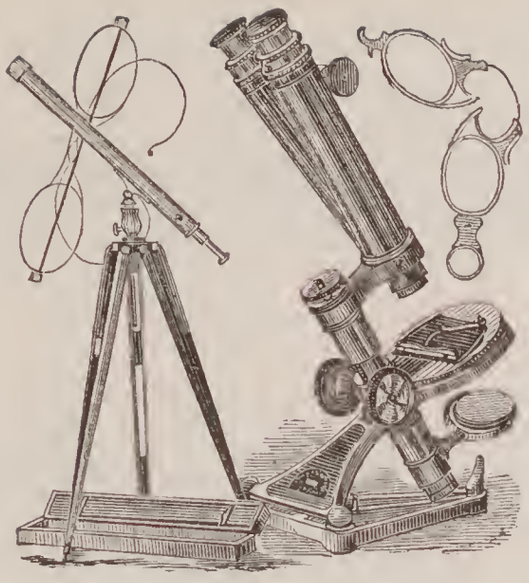

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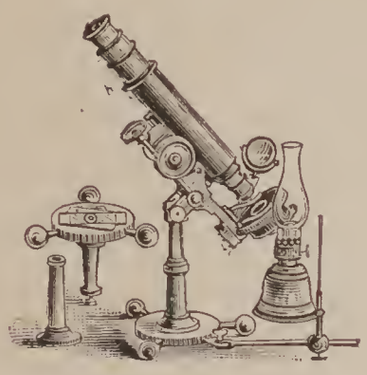

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.

Waves of Light; A Song..... 145
Cynips Quercus..... 146
Studies in Histology..... 149
Deposits on Snow..... 154
Beck's Vertical Illuminator..... 157

EDITORIALS:

The American Society of Microscopists, 160
How to reach Rochester..... 161
Editorial Briefs..... 161

CORRESPONDENCE: PAGE.

The American Society 162
Reply to Prof. McCalla..... 163
Working Department of American Society 163
Prospects of Rochester Meeting..... 164

REVIEWS:

Medical Diagnosis..... 166
Desmids of the United States 166
Illusions..... 167
The Century 167

Exchanges 167, 168

[Entered in the Post-Office at Ann Arbor, Mich., as second class matter.]
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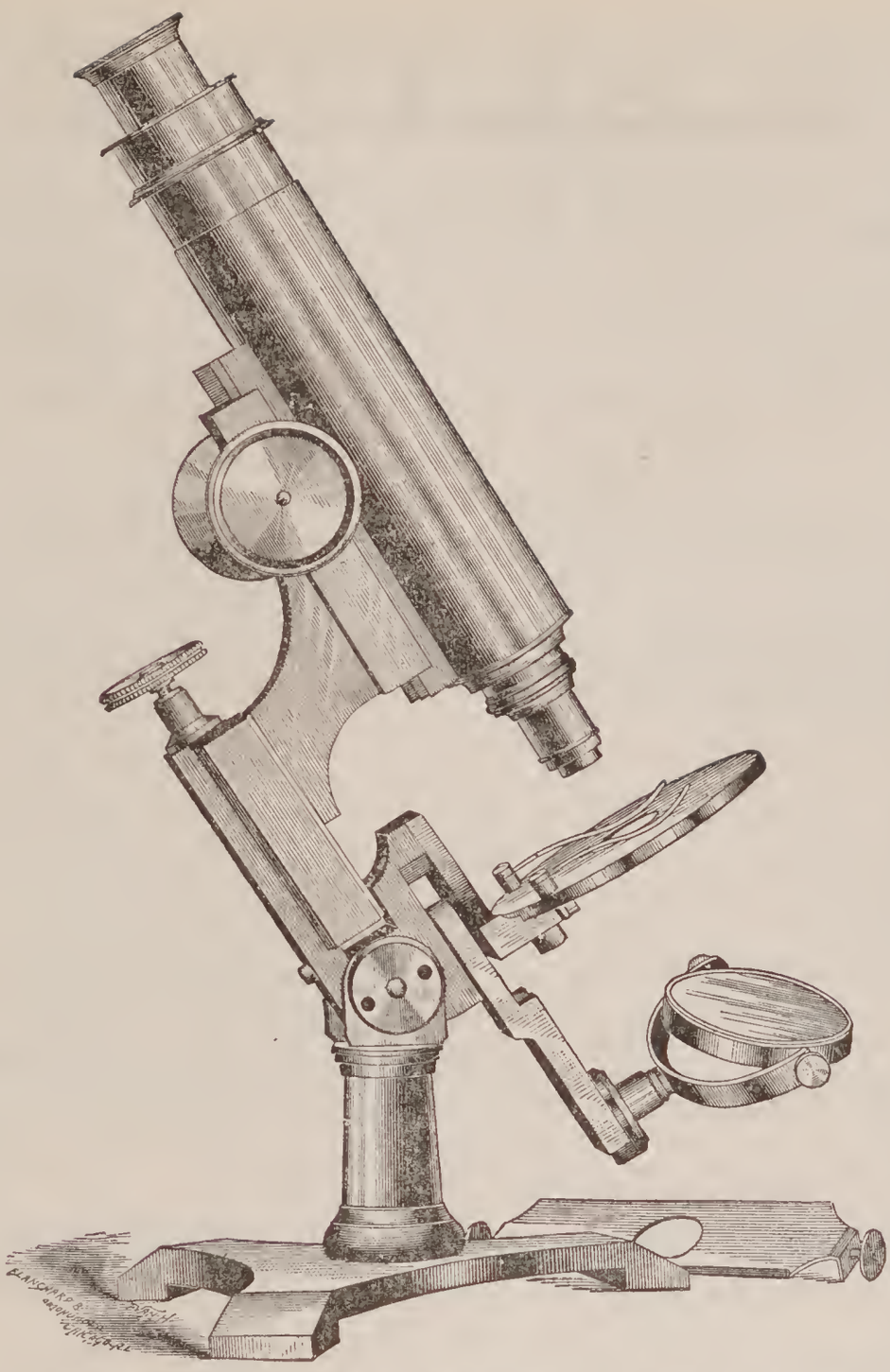

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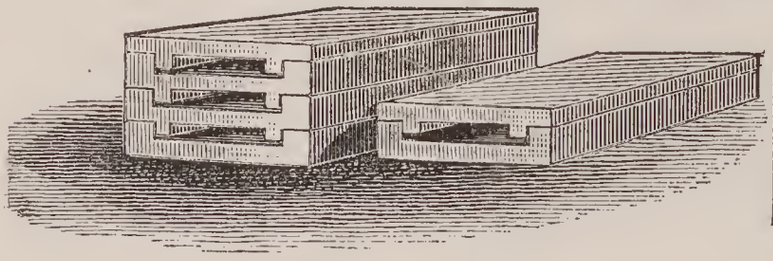

Fig. 1.

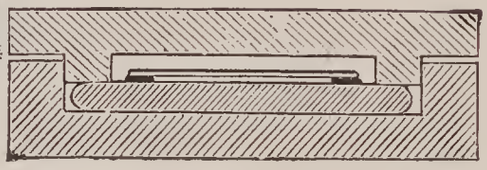

Fig. 2.

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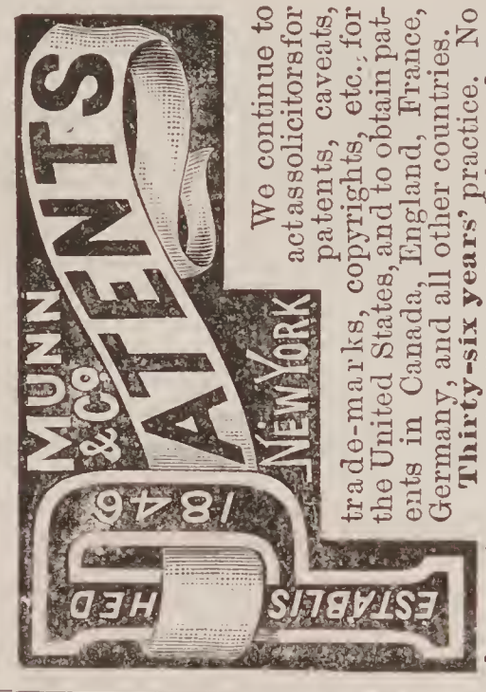

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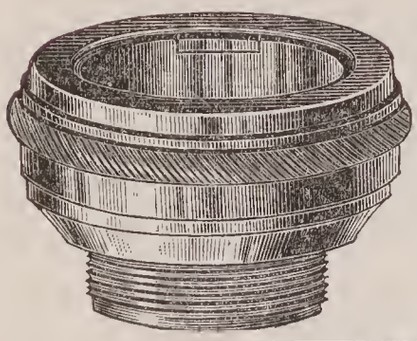

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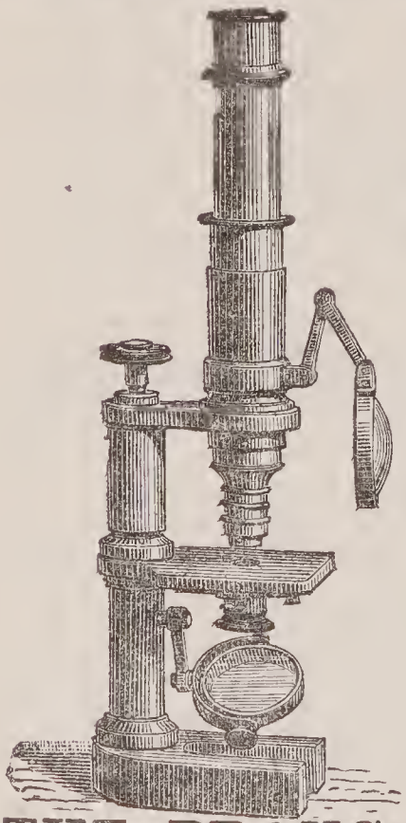

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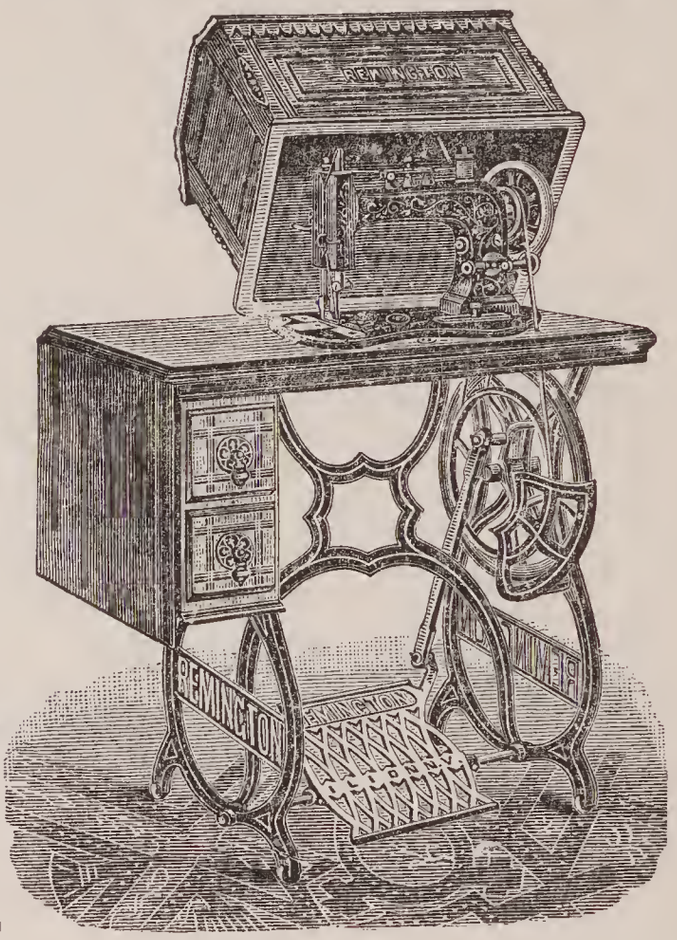

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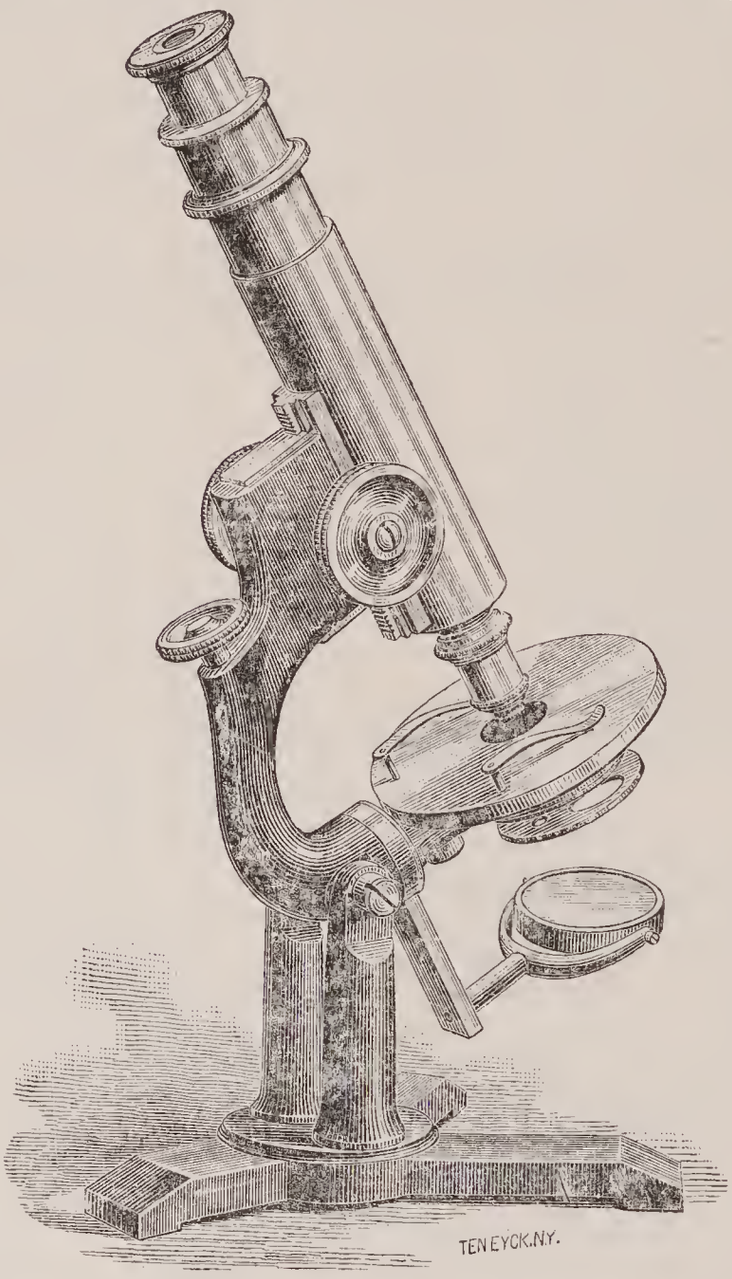

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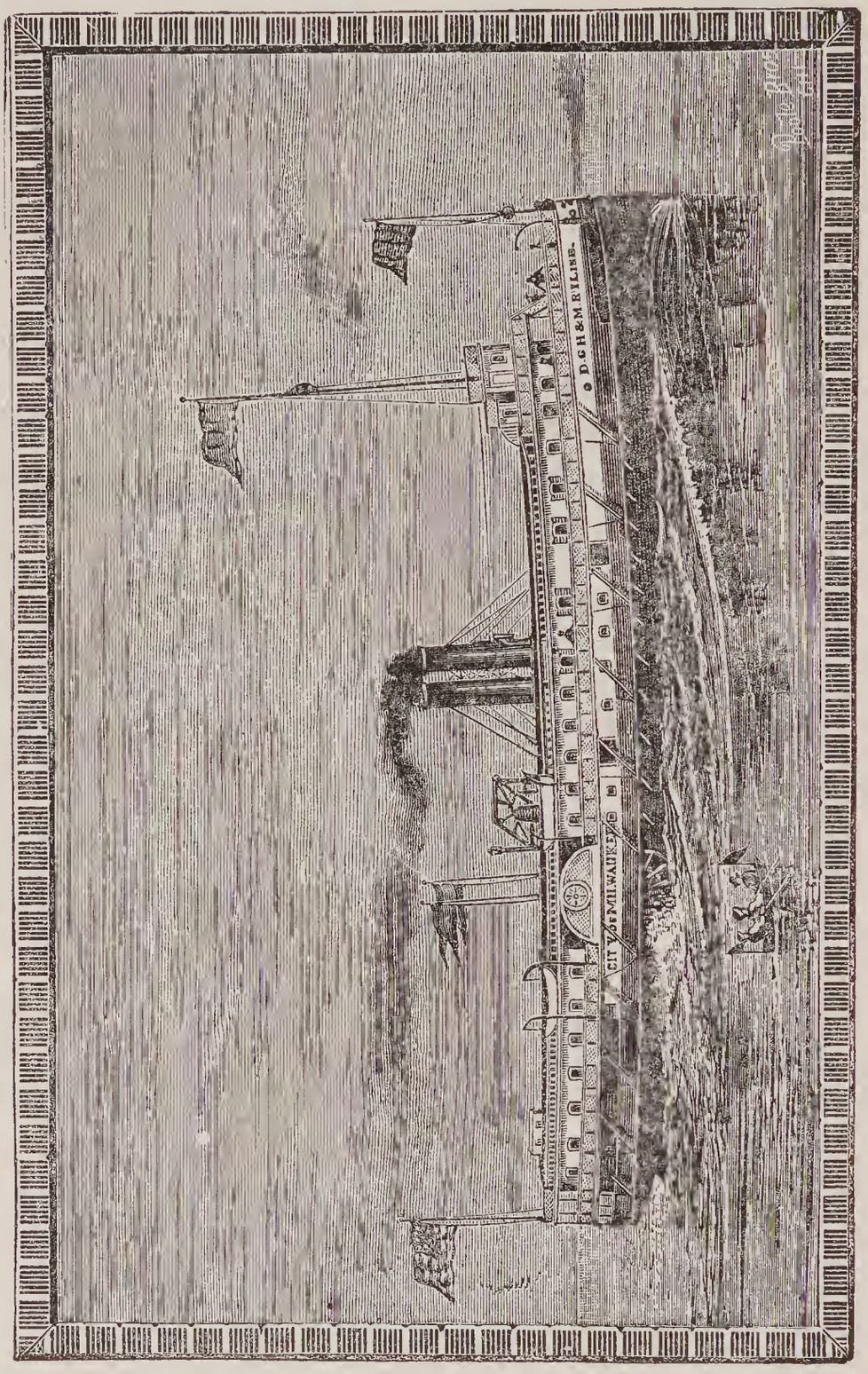

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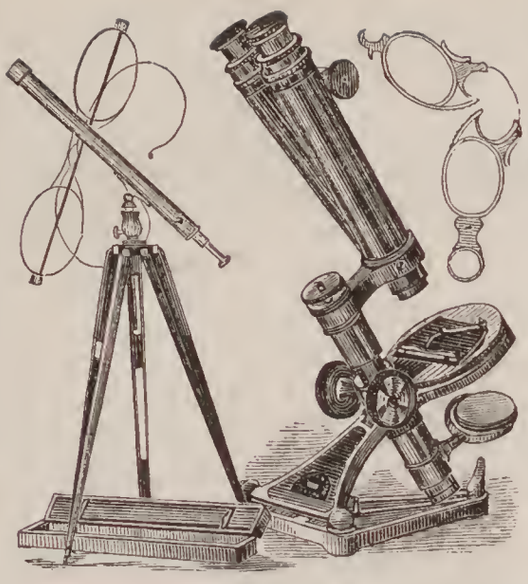

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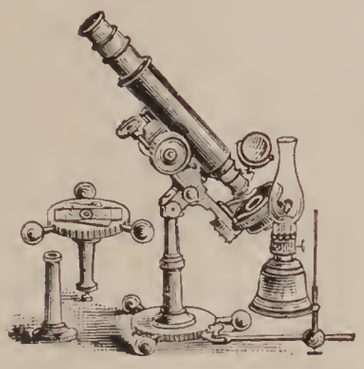

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE.

The Fakir's Secret..... 169
The Facility Nose-piece 171
Studies in Histology..... 171
A New Solid Watch-Glass..... 176
The Royal Mic. Jour. on Bacteria. 177
A New Mailing Case..... 179

EDITORIALS:

High Angles or Low Angles..... 180
A Life Preservative..... 180
Mr. Griffith's New Box,..... 180
A Fine Compliment..... 181
A New Microscopical Journal..... 181

PAGE.

SELECTIONS:

Sponge..... 182
The American Hog..... 184
The Germ Origin of Disease..... 185
Francotte's Section-Flattener..... 187

REVIEWS:

A Palace-Prison..... 188
The White Mountains..... 188
A Country Doctor..... 189
The Origin of Species..... 189

OUR ADVERTISERS..... 190

At the Doctor's Expense..... 190

ITEMS 192

Exchanges 193

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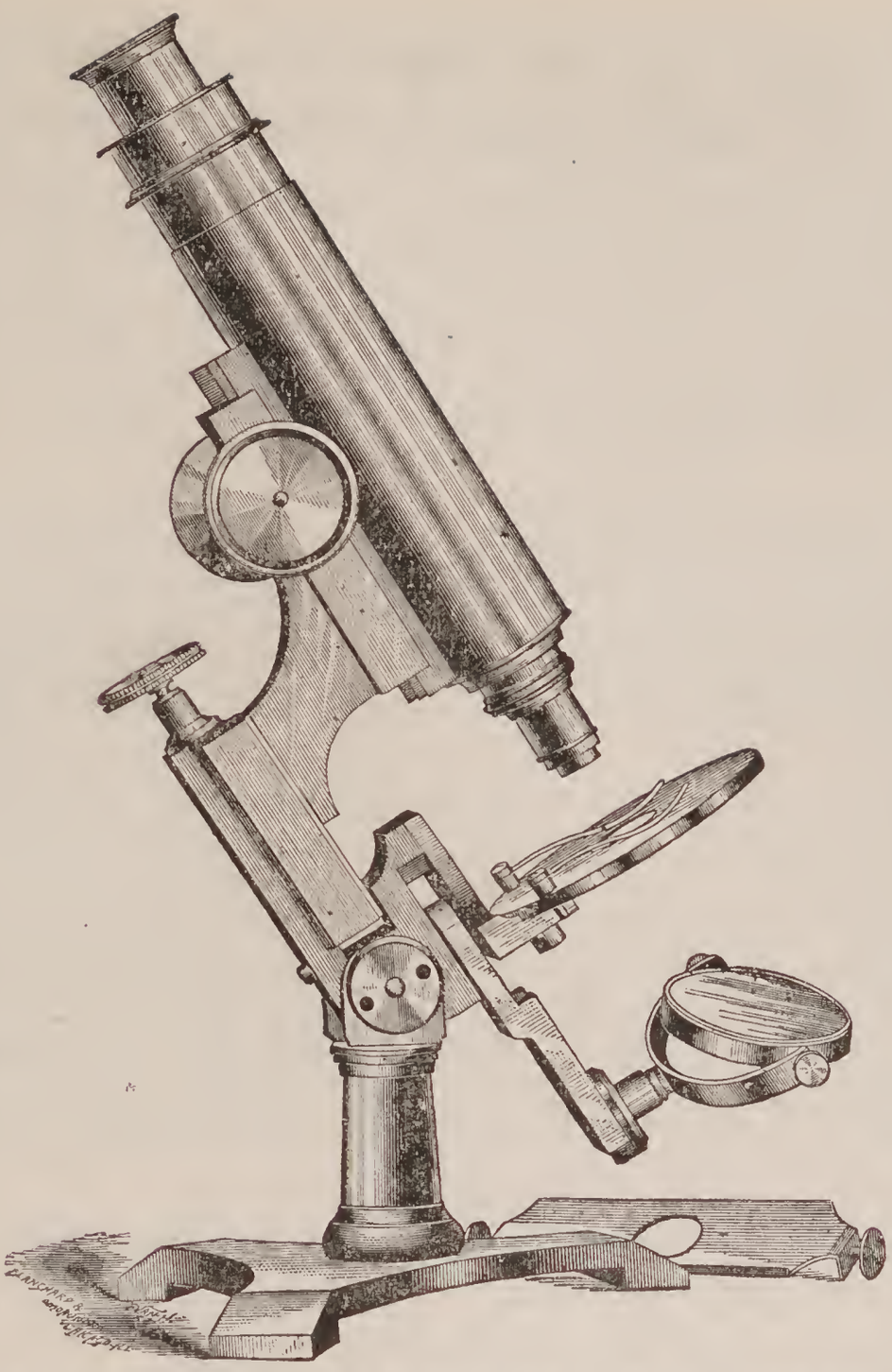

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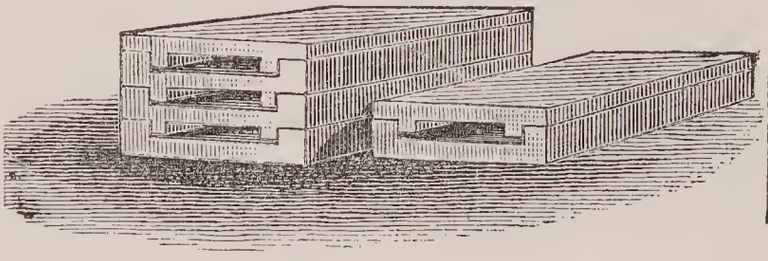

Fig. 1.

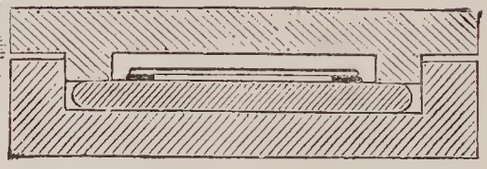

Fig. 2.

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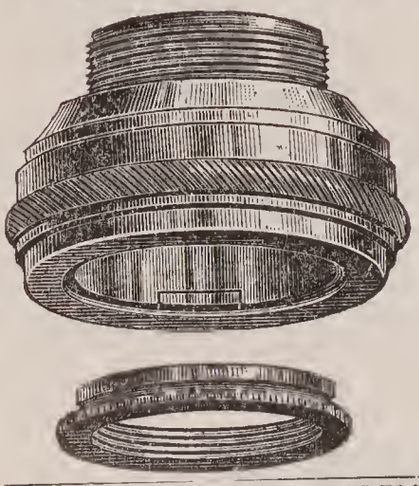

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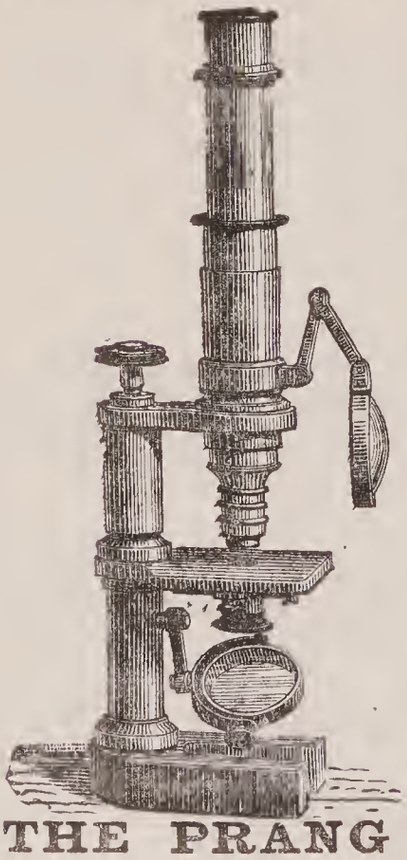

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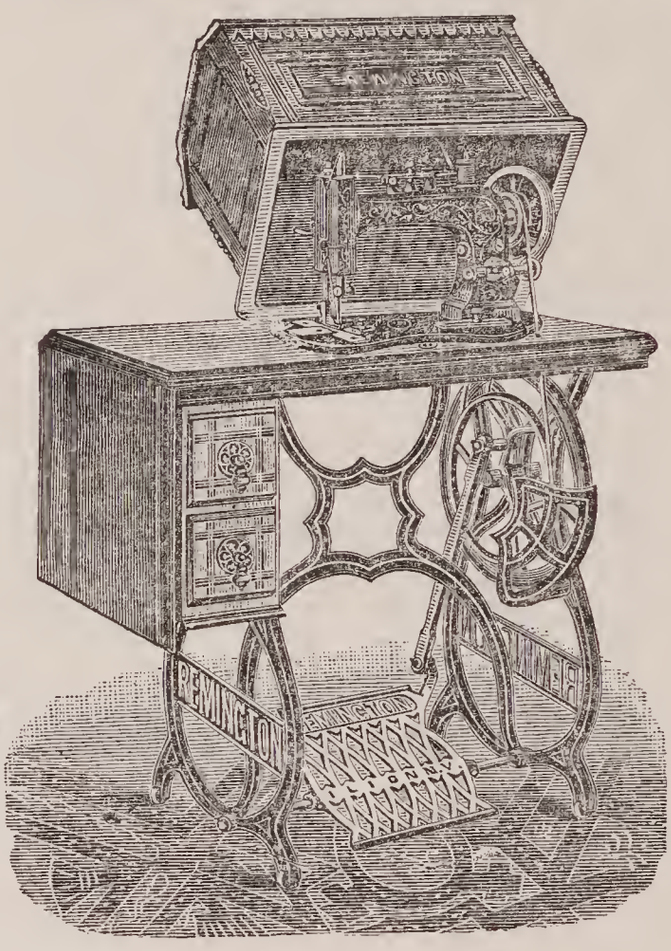

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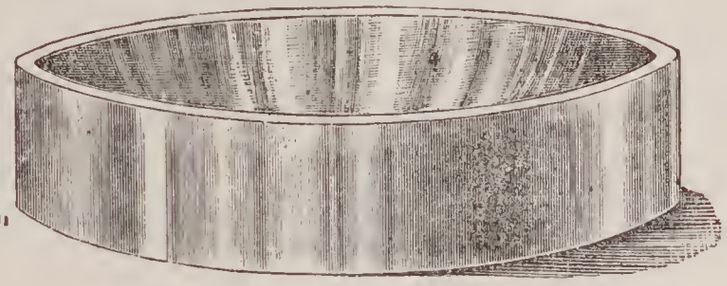

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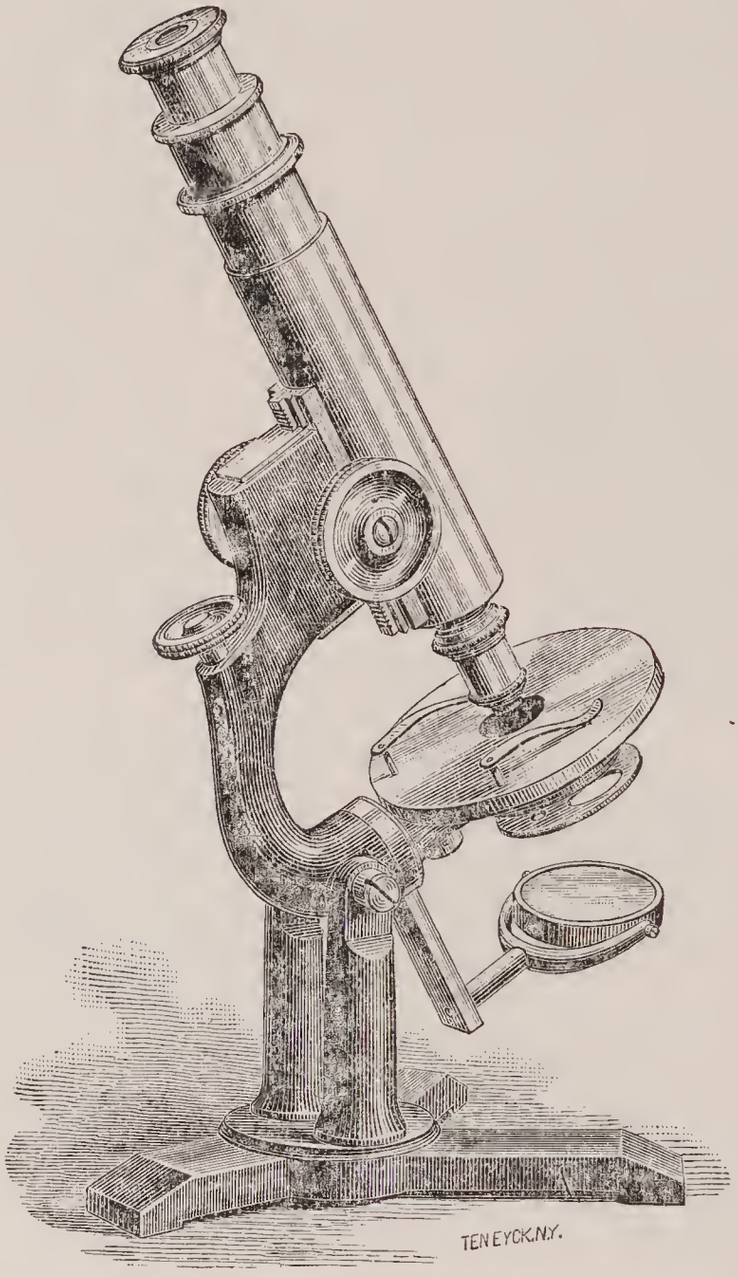

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ADDITIONAL EXCHANGES, CONTINUED FROM PRECEDING PAGE.

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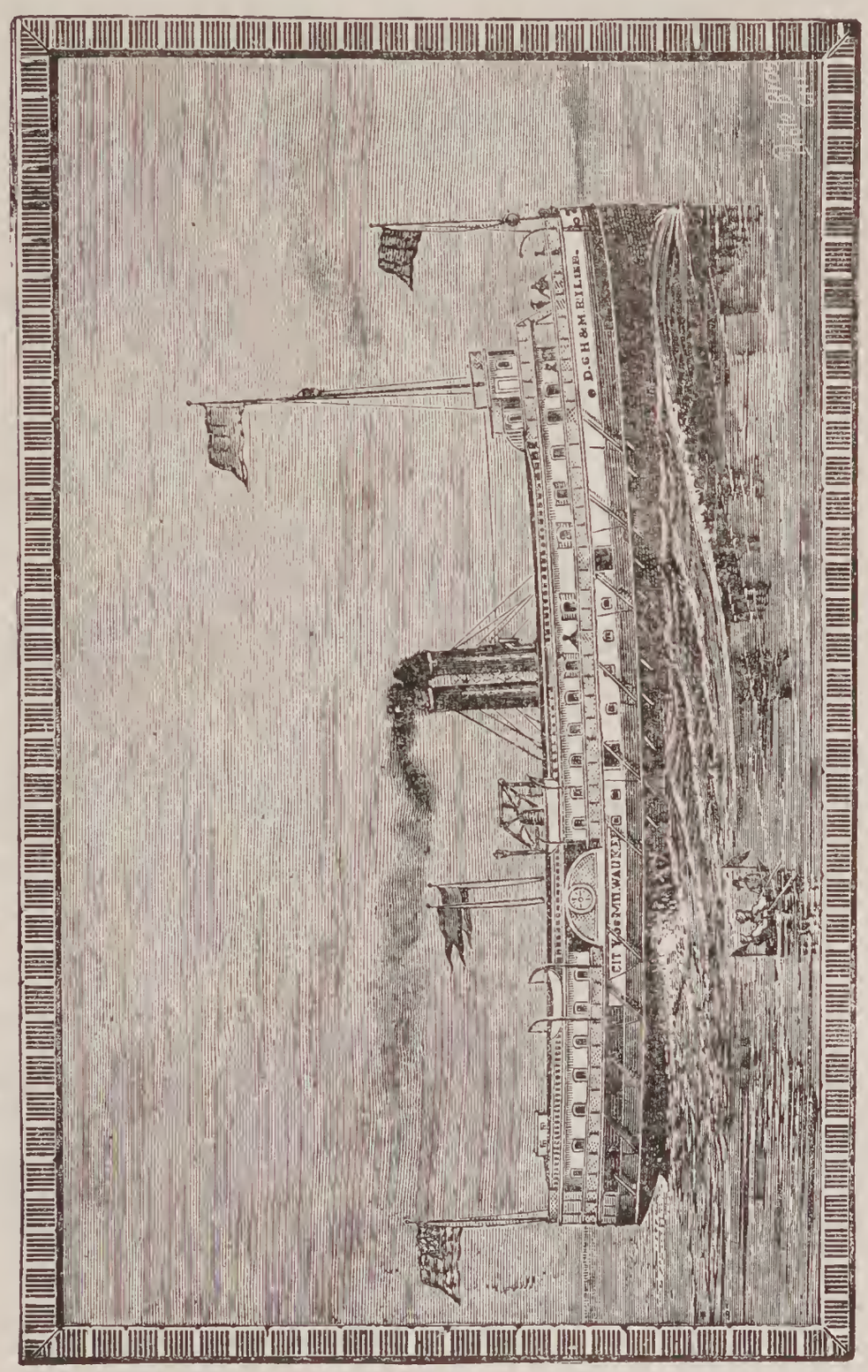

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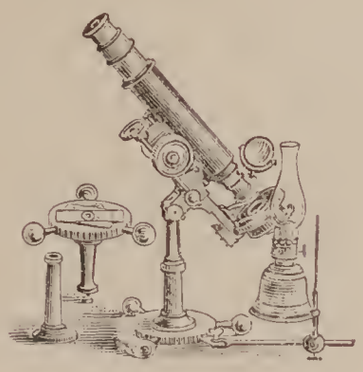

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CHAS. H. STOWELL, M. D., F. R. M. S.,
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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS:

	PAGE
The Rochester Meeting	193
Remarks of Dr. Dallinger	195
Morphology of Rheumatic Blood	195
Fungi found in Sewage	196
Hair, Medico-Legally Considered	197
The President's Address	201
Memoir of Mr. Tolles	202
A New Section Cutter	205
The Soiree	206
The Examination of Handwriting	207
The New Officers	208

EDITORIALS:

	PAGE
As Natural as Life	209
The Rochester Meeting	209
Editorial Briefs	210
SELECTIONS:	
How to Mount Insects	211
How to Prepare, Stain and Mount Vegetable Sections	212
REVIEWS:	
The World's Opportunities	215
The Century	215
Exchanges	215, 216

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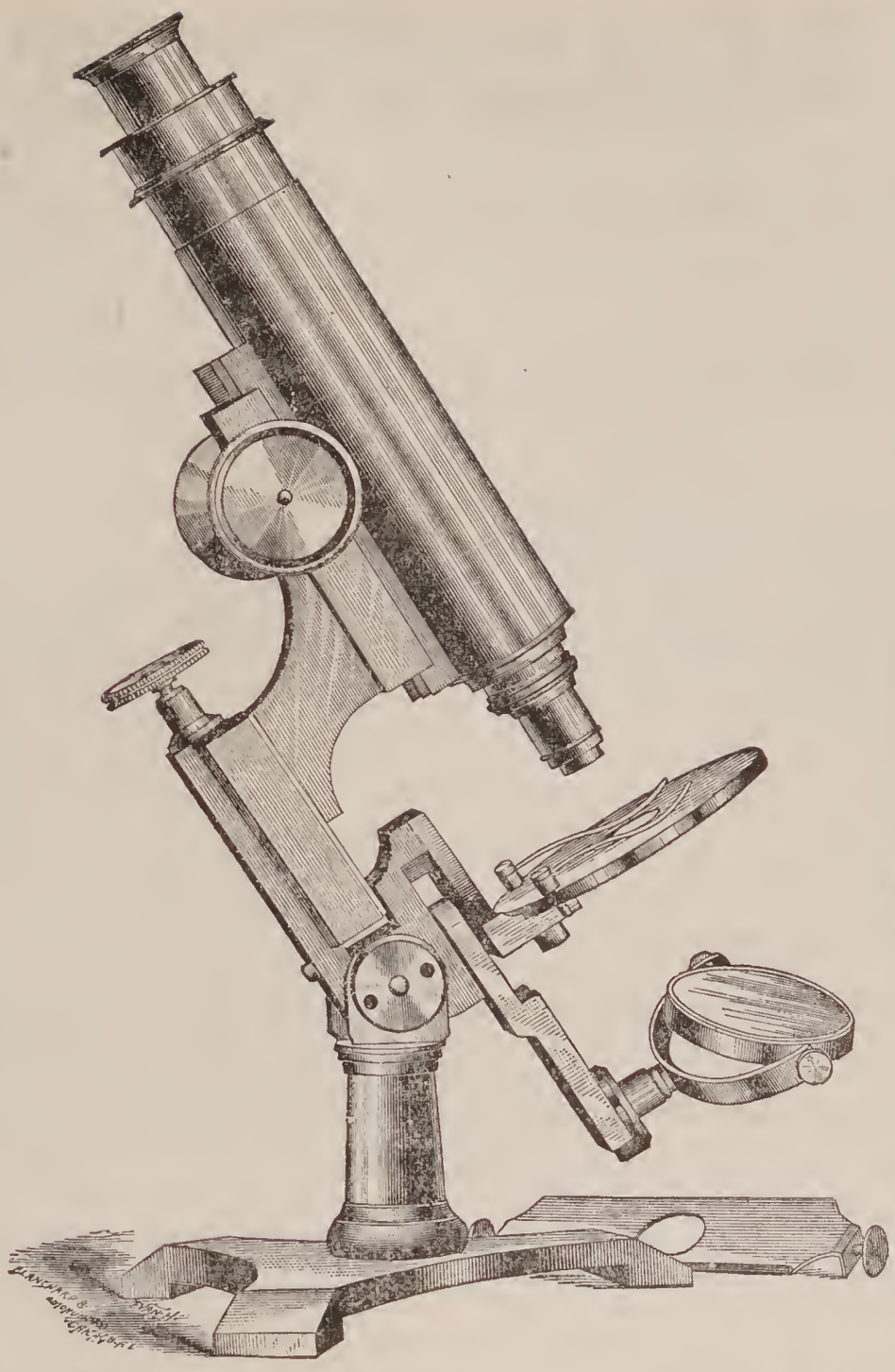

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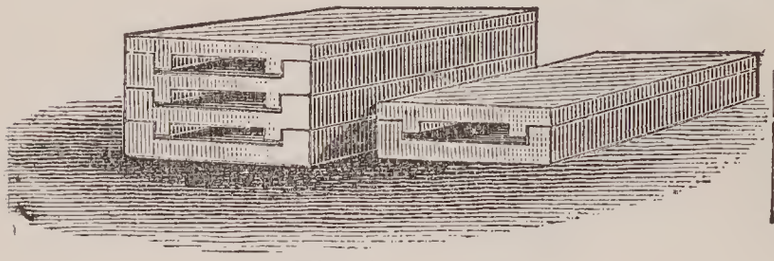
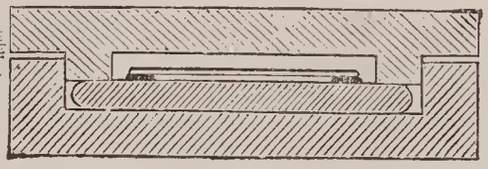


Fig. 1.



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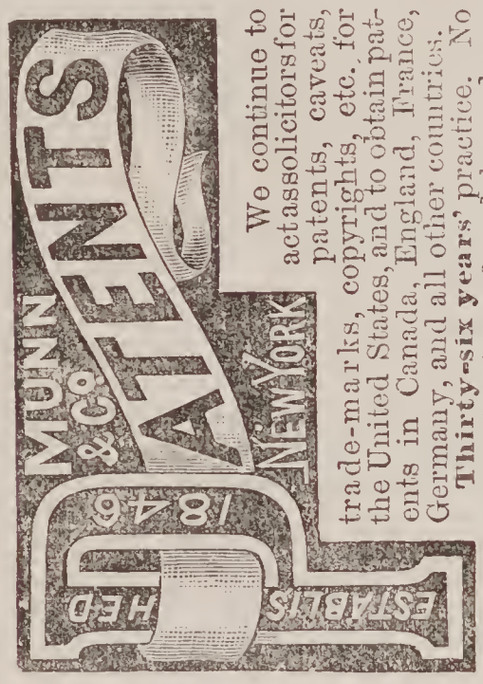

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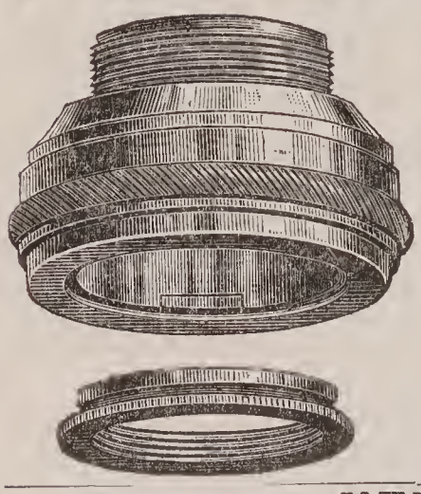

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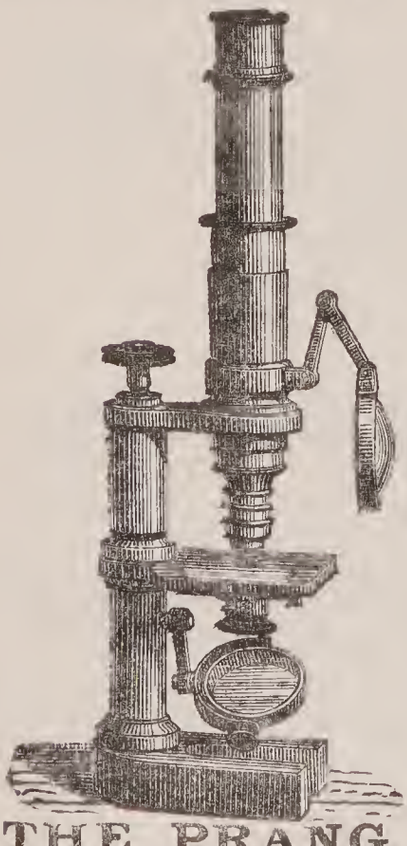

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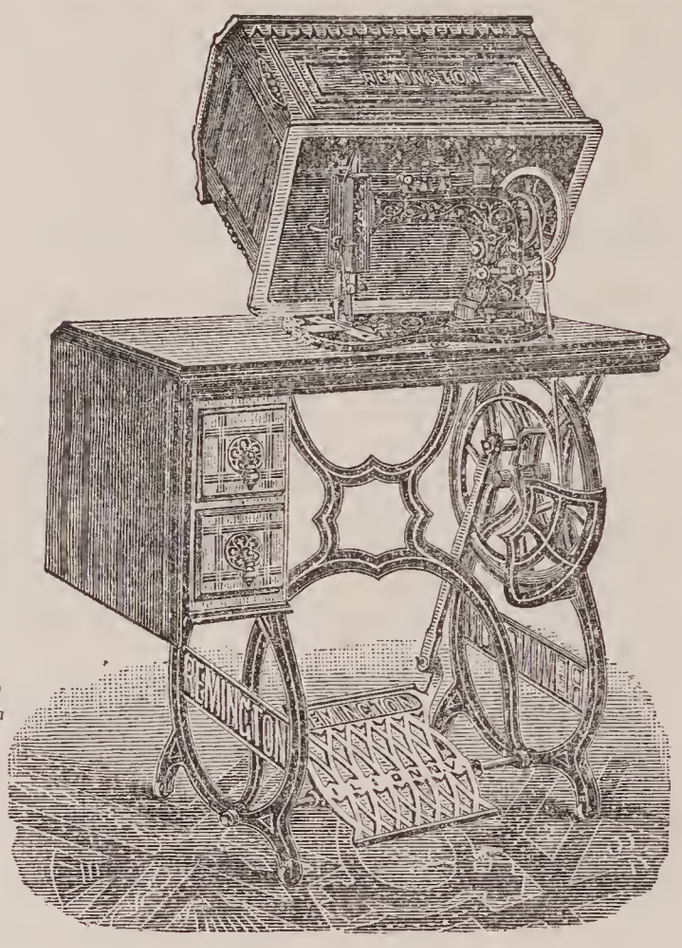

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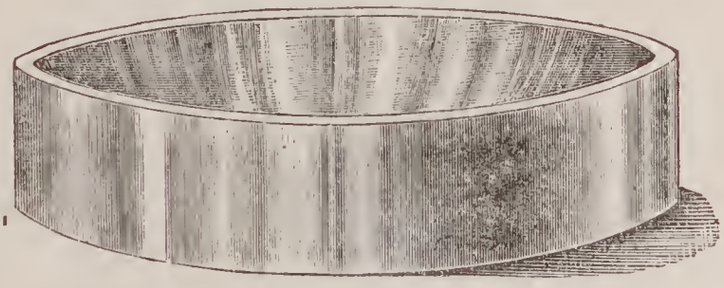

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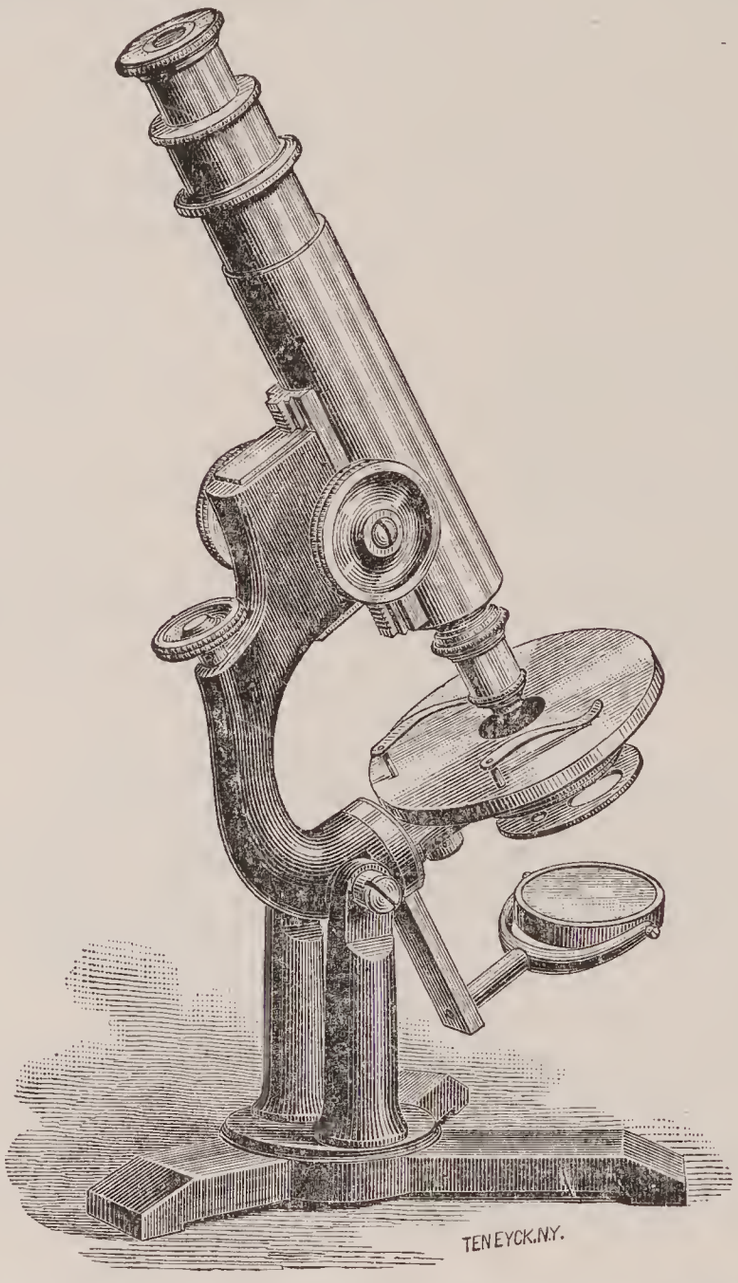

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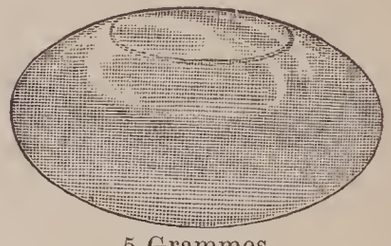

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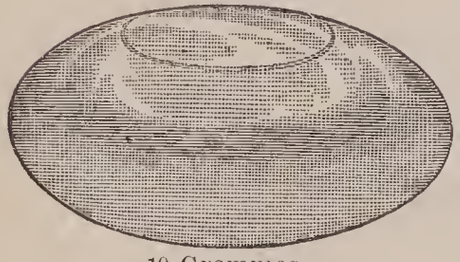

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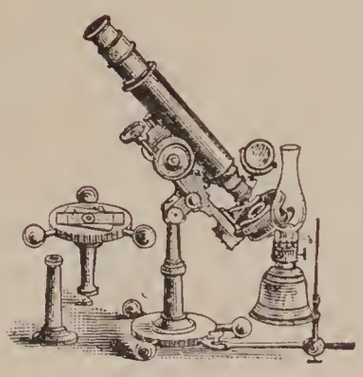

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EDITED AND PUBLISHED BY

CHAS. H. STOWELL, M. D., F. R. M. S.,
Professor of Histology and Microscopy, Univ. of Mich.

LOUISA REED STOWELL, M. S.,
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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS:

	PAGE
Hydrastis Canadensis	217
A Queer Rhizopod	219
Identification of Blood Corpuscles	219
The Annual Proceedings	223
Zentmayer Nose-picce	224
Easy Method of Obtaining Bacteria	224
Aspects of the Body in Vertebrates and Arthropods	225

EDITORIALS:

Important Announcement	228
A Working Session	228
The Great Lights of the Past	228
What Our "Friends" Say	229
To See is to Believe	230
It Tells Its Own Story	231

SELECTIONS:

The Doctor's Prayer	232
The Working Session	234
Scientific Fallacies	235
Bacteria in Blood	236
The Section of Microscopy at Philadelphia	237
Notices	239
Exchanges	239, 240

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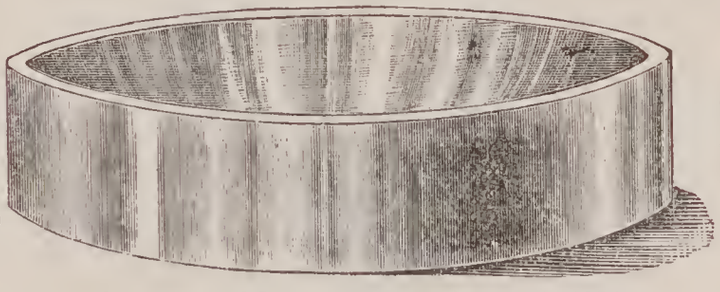

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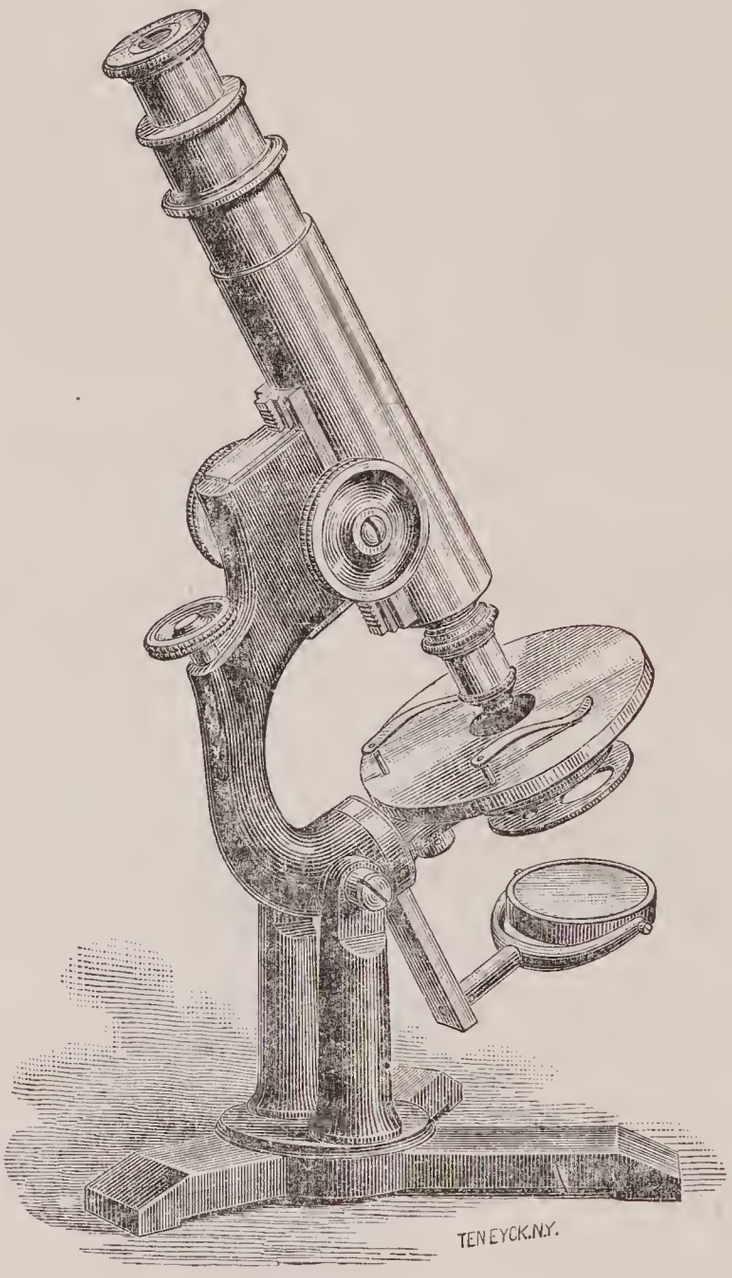

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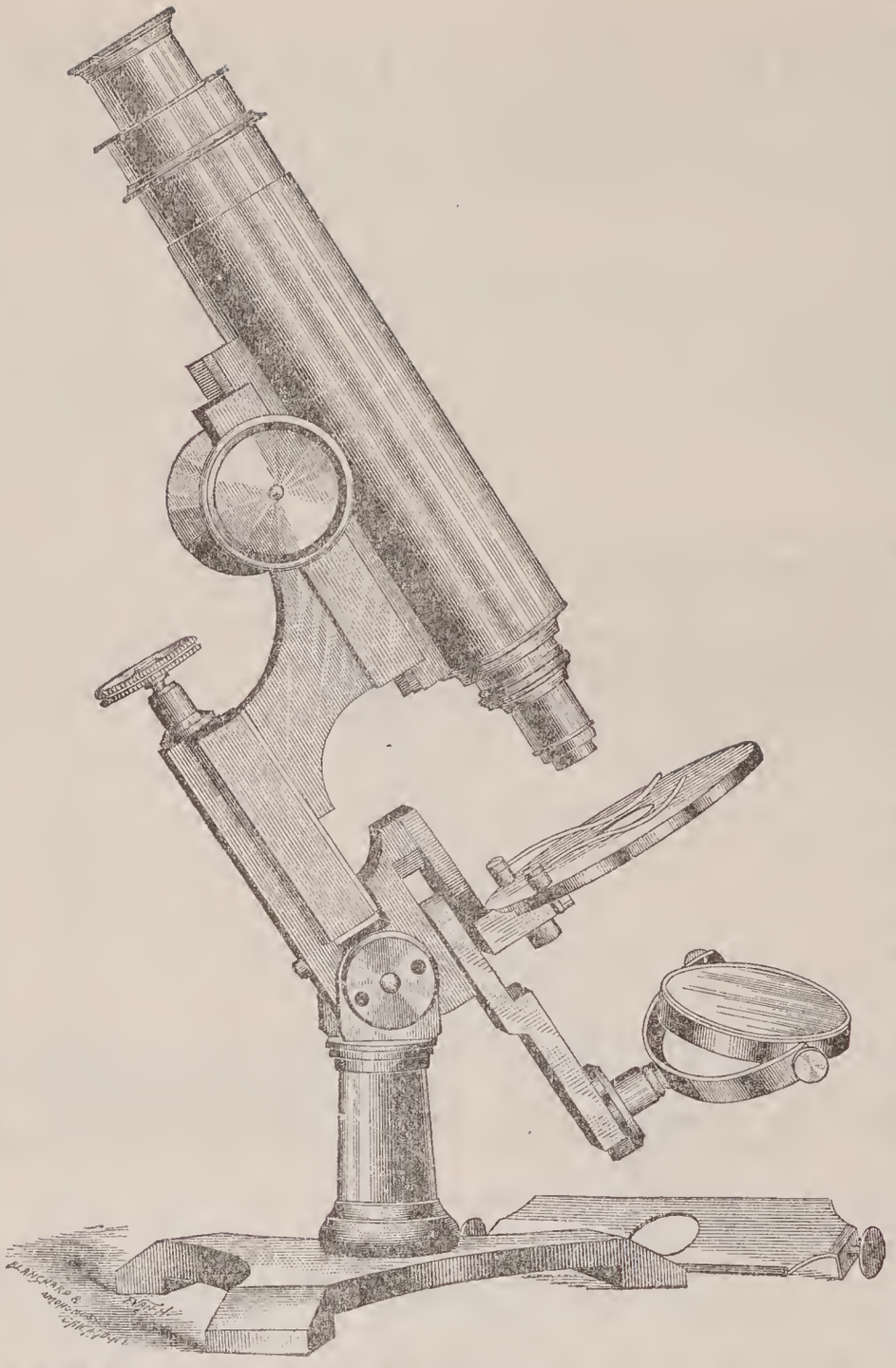

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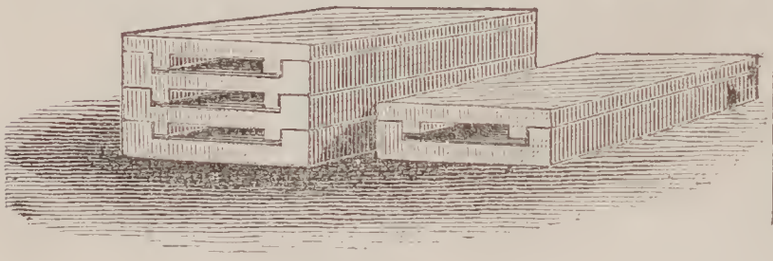
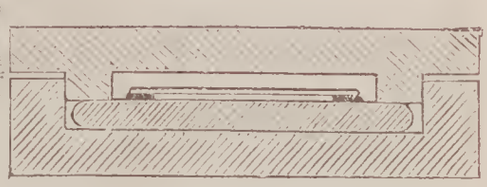


Fig. 1.



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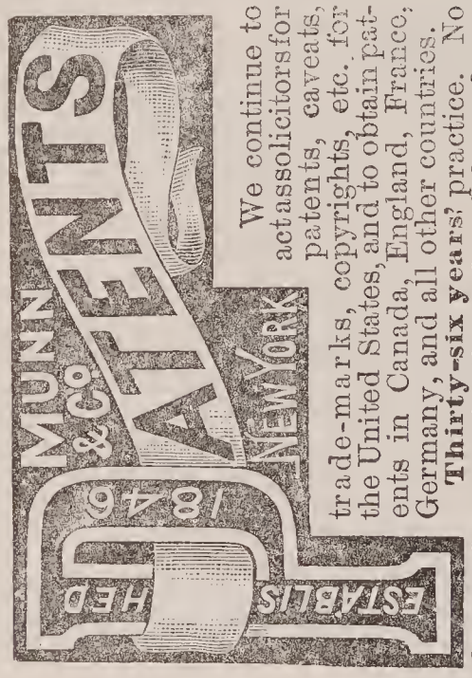

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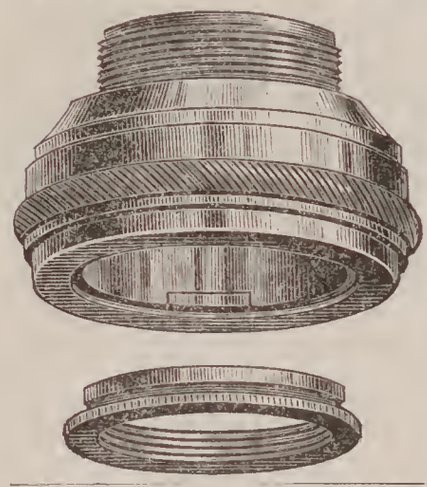

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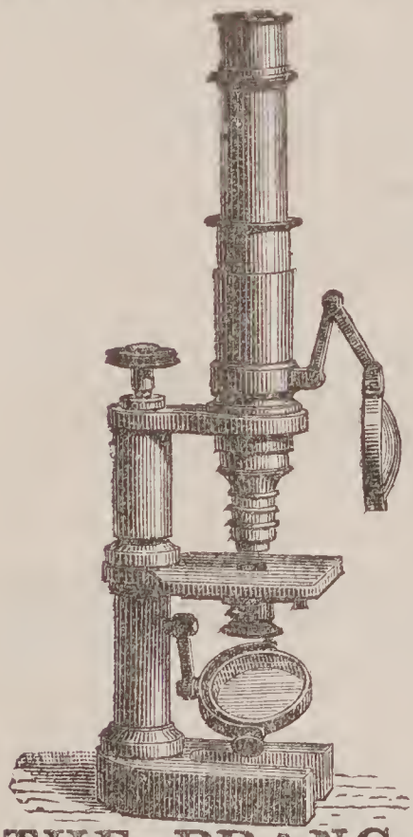

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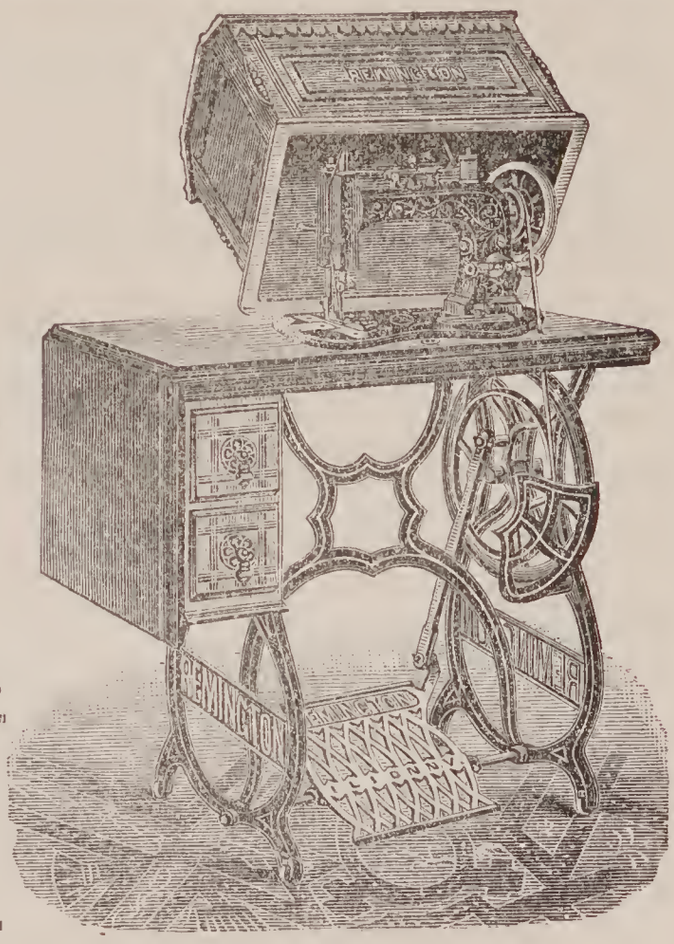

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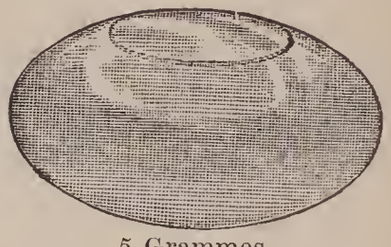

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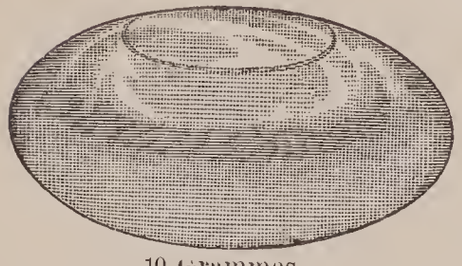

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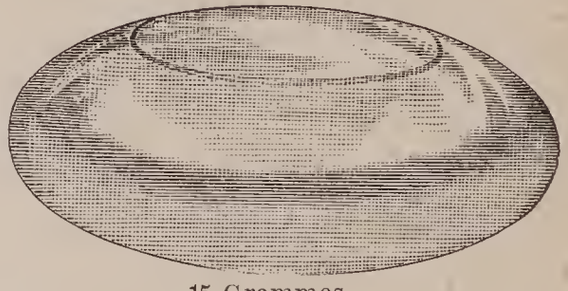

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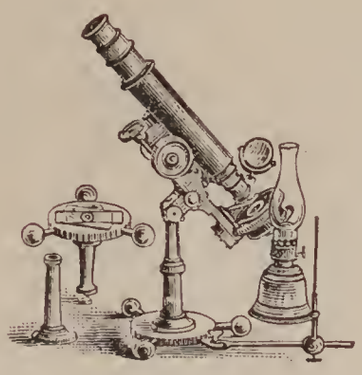

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS:

PAGE

A Beautiful Slide..... 241
Identification of Blood Corpuscles..... 241
The Working Department..... 242
Griffith's Turn-table..... 243
Hints on Technique..... 243
Aperture and Working Distance..... 246
An Unusual Infusorian..... 248

SELECTIONS:

Lowest and Smallest Forms of Life..... 254
Intercellular Spaces..... 259

REVIEWS..... 260

ITEMS:

To Mount Bone..... 261
The Dioscope..... 261
The Pineal Gland..... 261
Cellulose and Formation of Crystals..... 262
The Tubercle Bacilli..... 262
Reflection of Light in Leaves..... 262
Exchanges..... 263, 264

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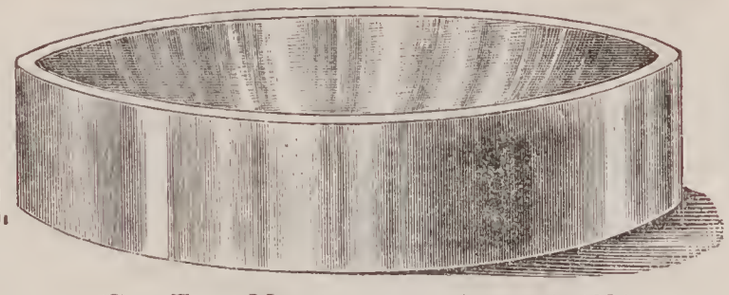

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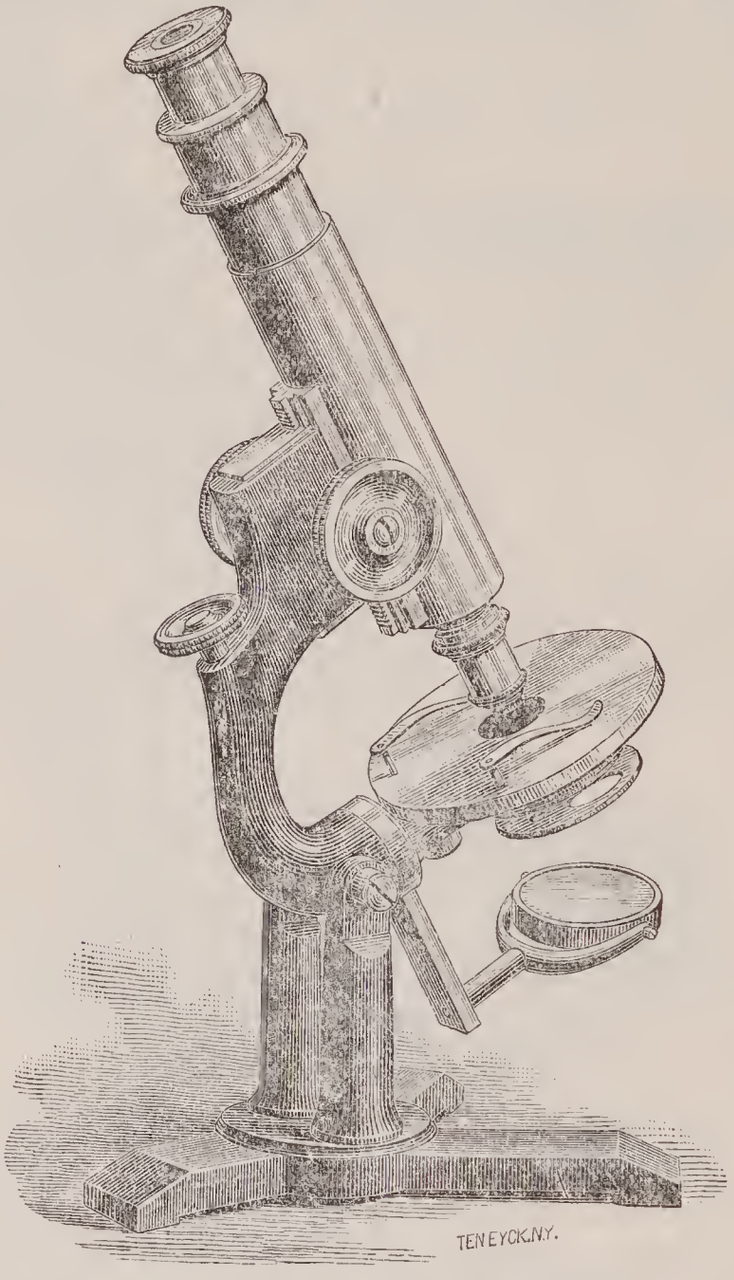

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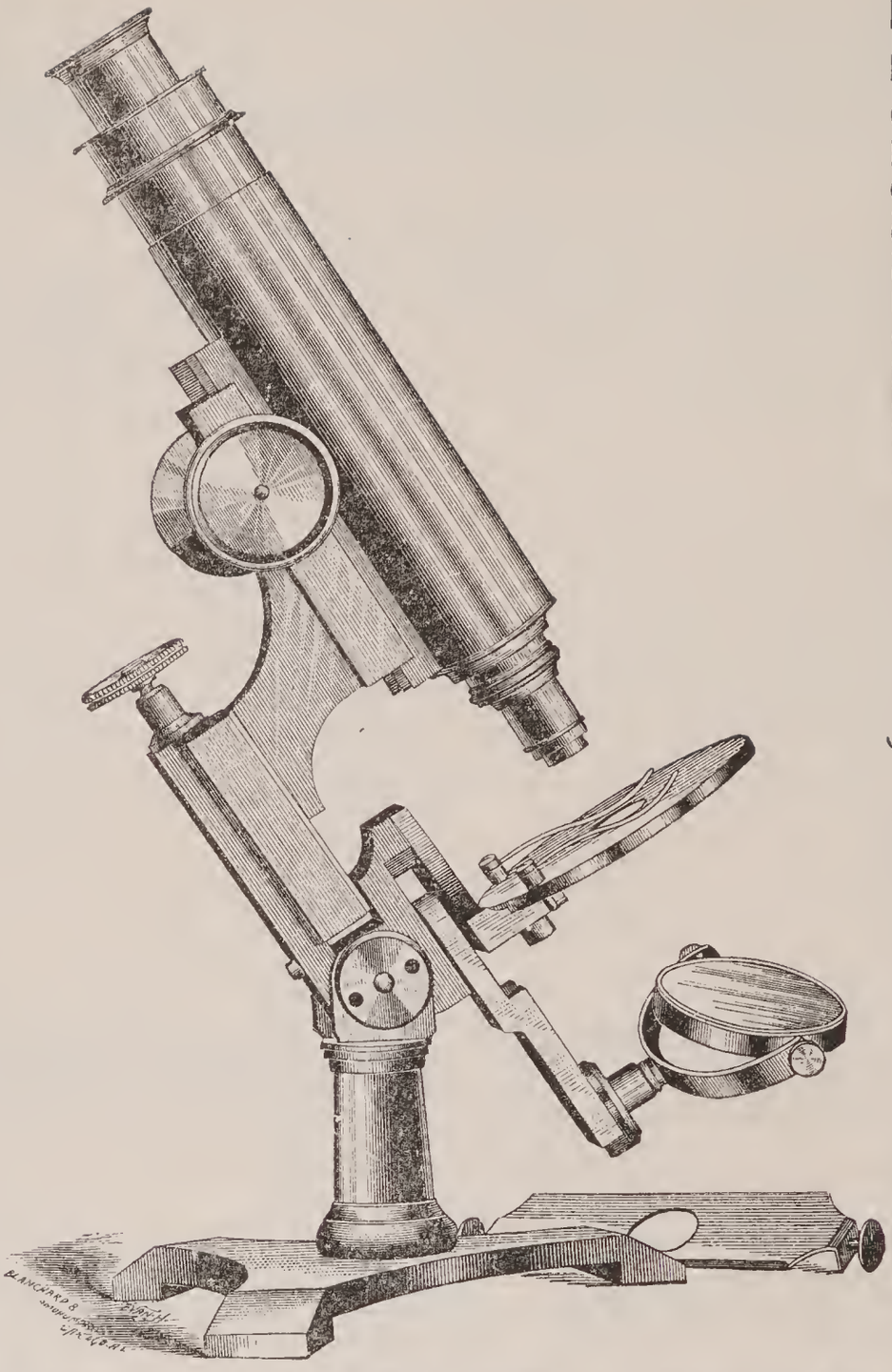

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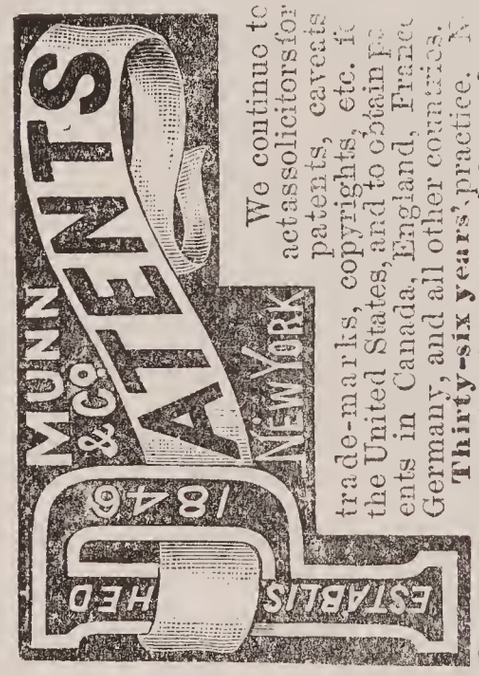

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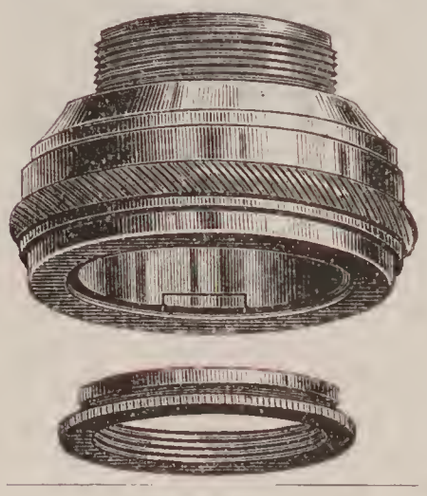

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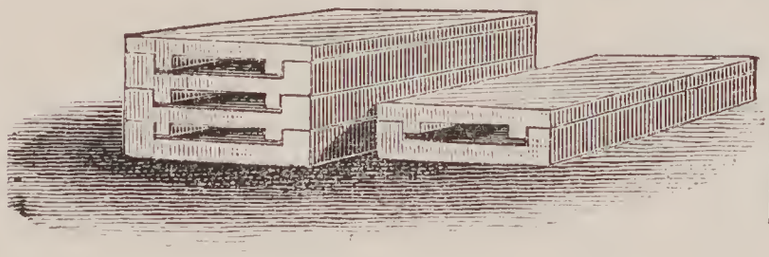
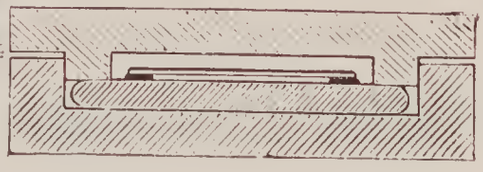


Fig. 1.



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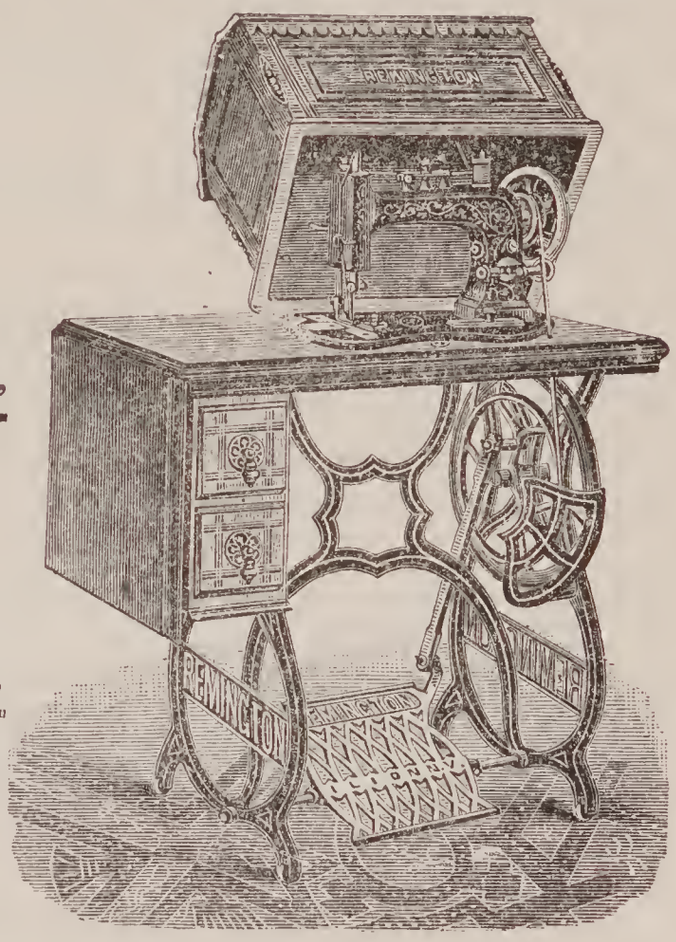

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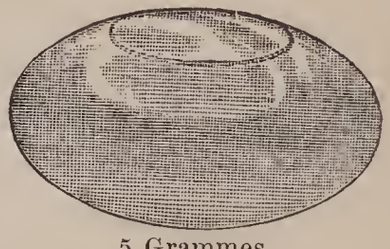

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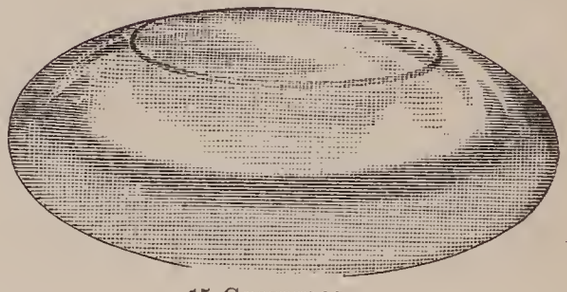

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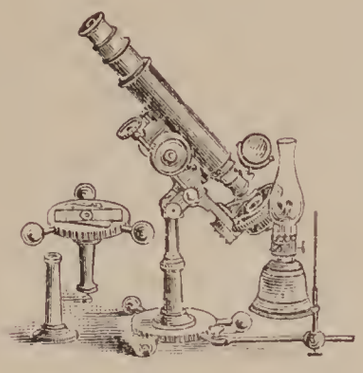

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LOUISA REED STOWELL, M. S.,
Assistant in Microscopical Botany, Univ. of Mich.

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TABLE OF CONTENTS.

ORIGINAL COMMUNICATIONS: PAGE

Studies in Histology 265
The Parasite in "Chicken Gapes" 271
The Phenomenon of Multiple Image 272
The Origin of Renal Calculi 273

RESULTS OF MICROSCOPICAL RESEARCH:

Embryology of Sponges 275
Symbiosis 276
Anatomy of Insects 276
Bacteria on coins 277

EDITORIALS:

Our Journal for 1885 278
Valuable Articles for Next Year 279

SELECTIONS:

Mounting the Diatomaceæ 280
Cleaning and Mounting Polycystina 280

REVIEWS 283

INDEX .....

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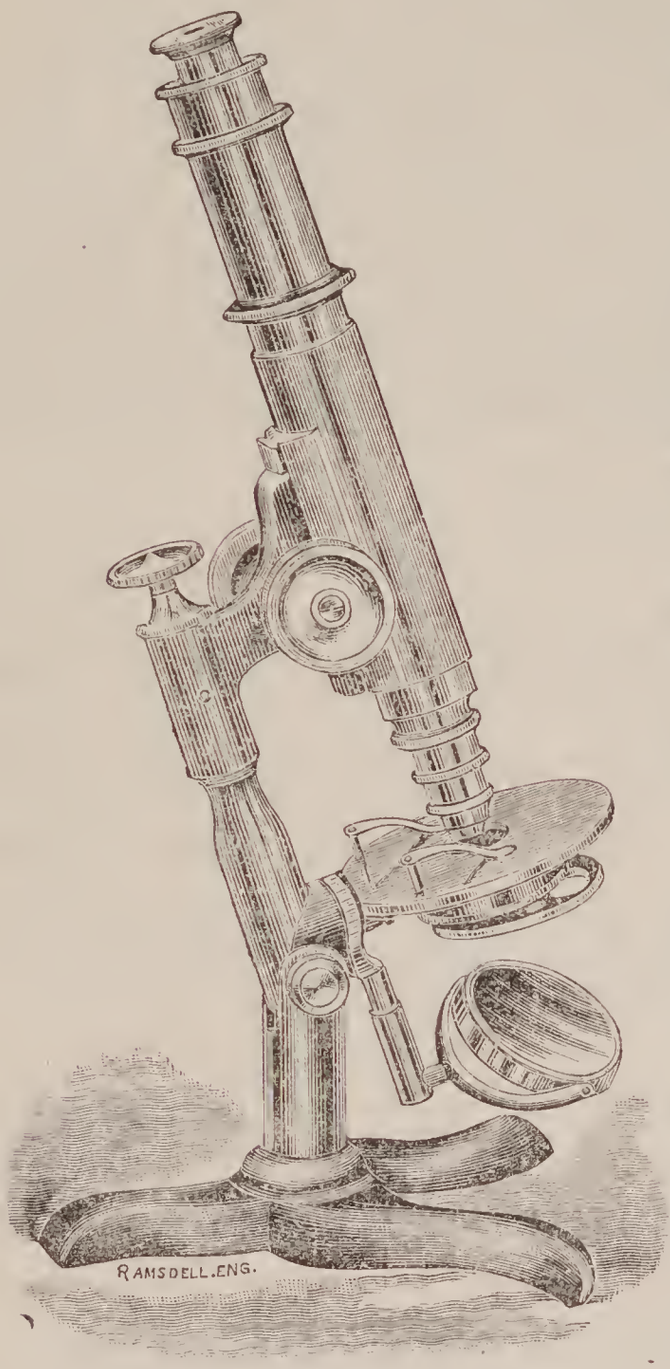

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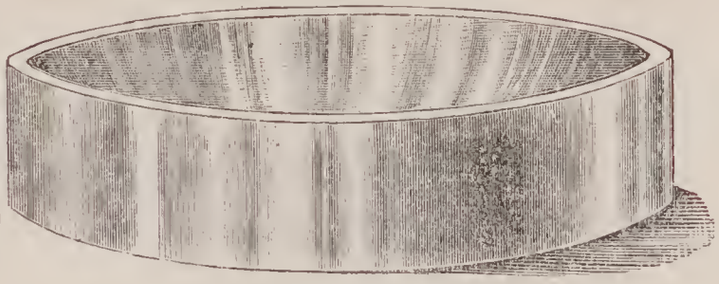

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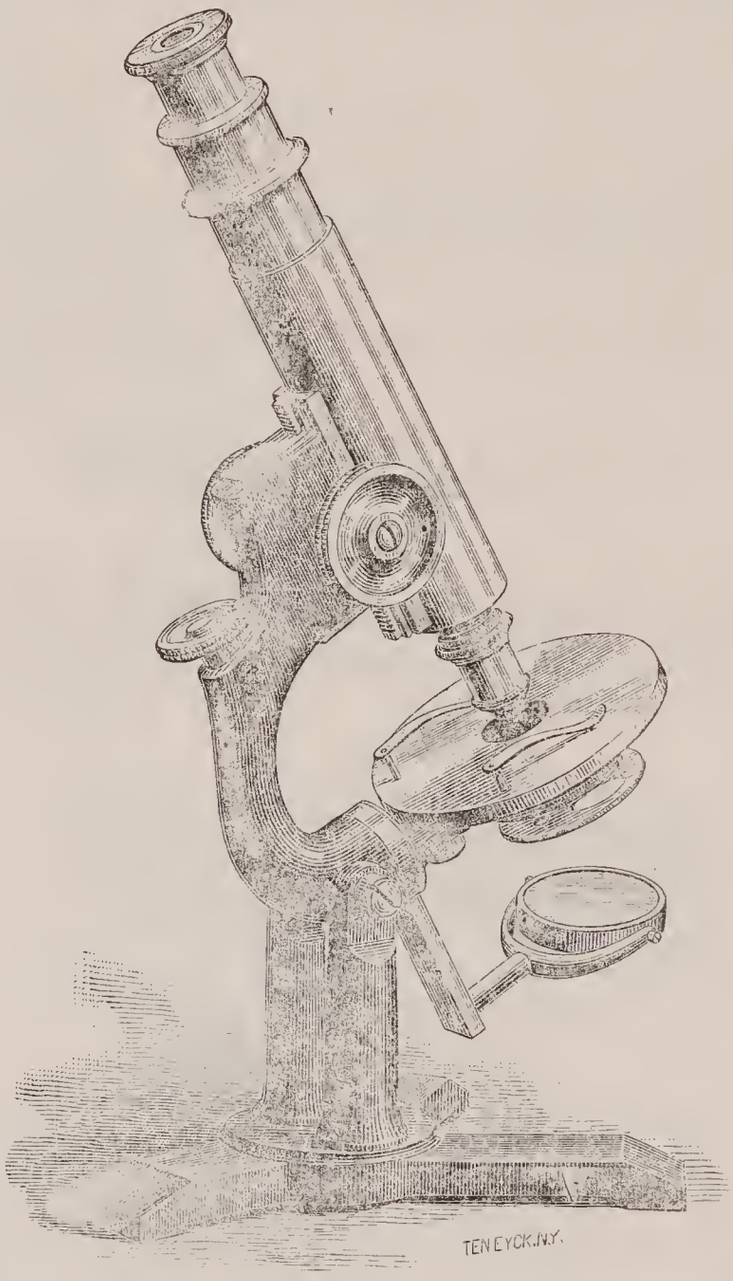

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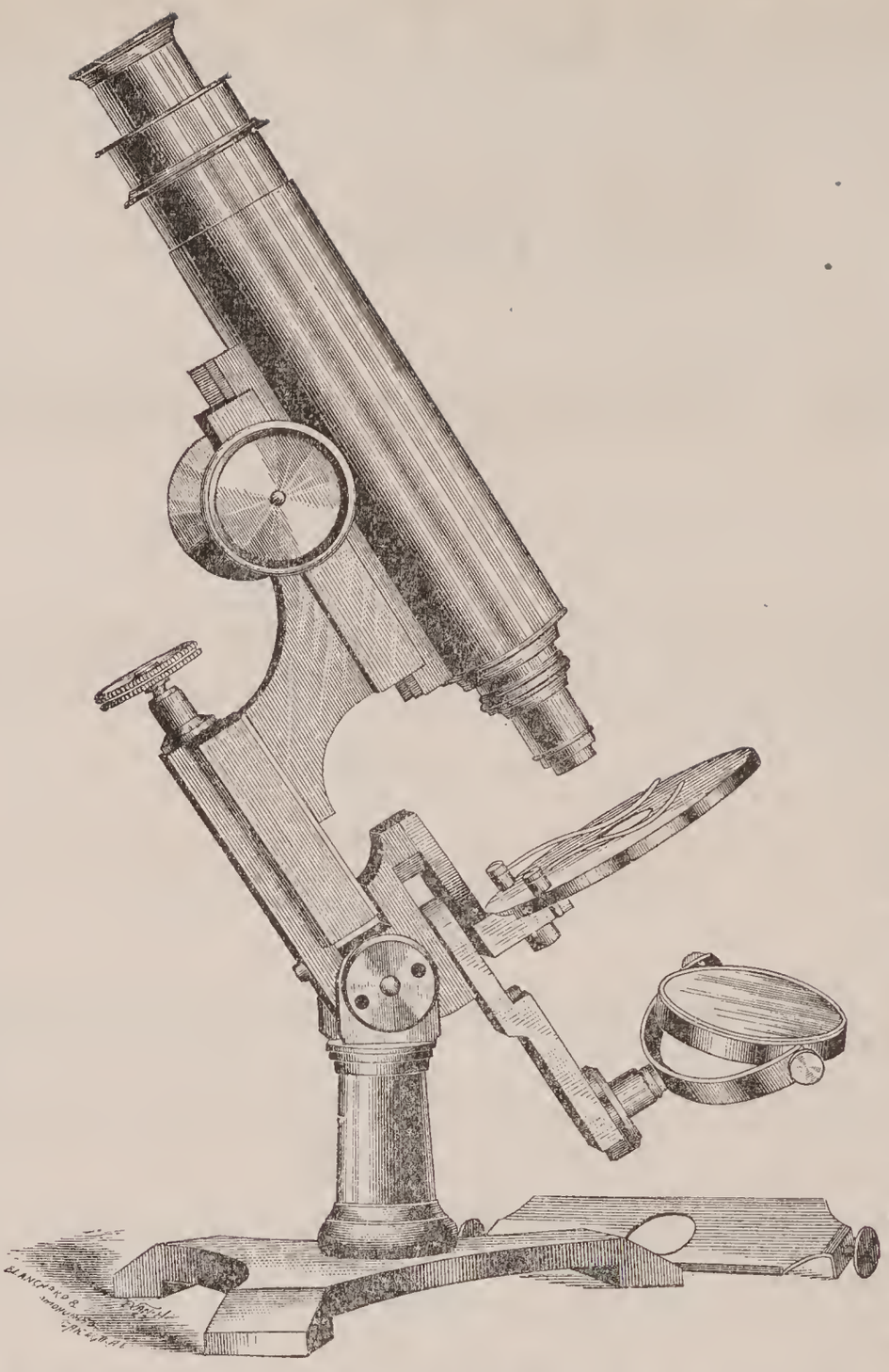

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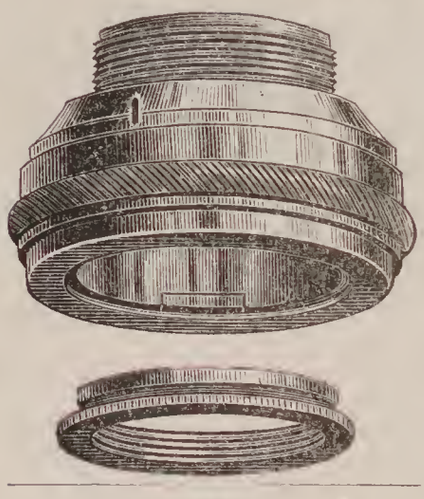

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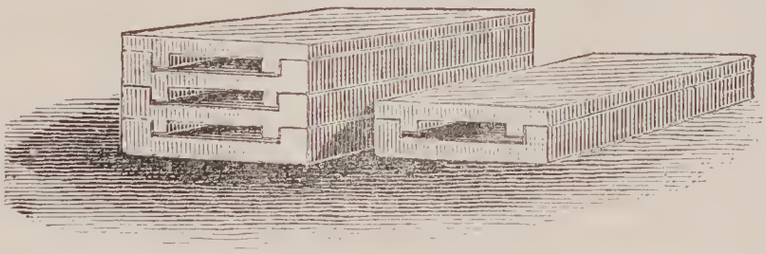

Fig. 1.

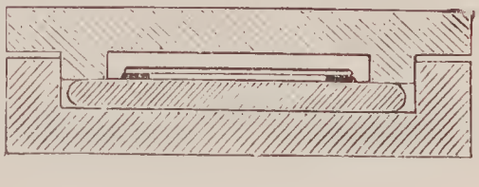

Fig. 2.

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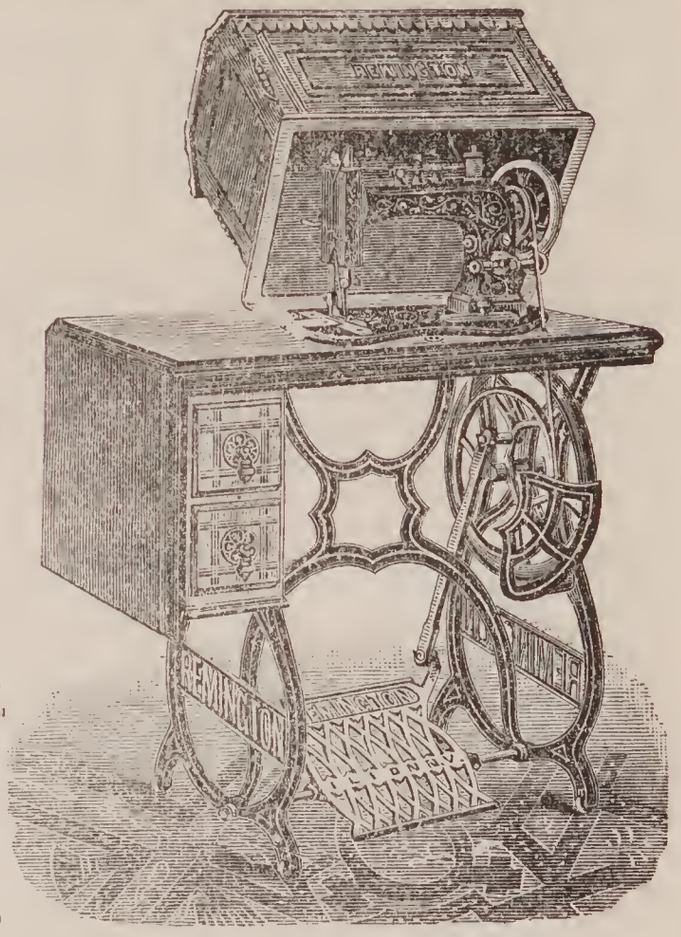

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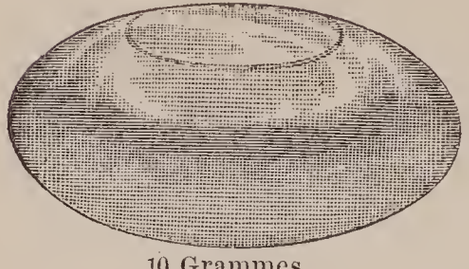

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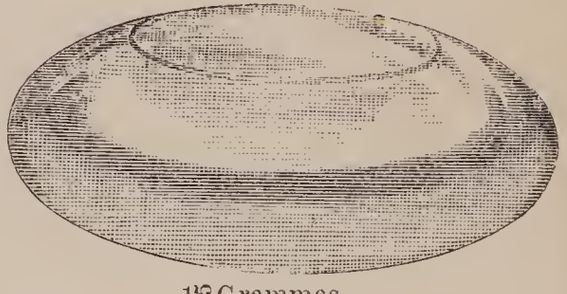

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